E
Distr.
LIMITED
ST/ECA/SEM/8
5 July 1981
Original: ENGLISH

UNITED NATIONS

ECONOMIC AND SOCIAL COUNCIL

ECONOMIC COMMISSION FOR AFRICA

Seminar on Household Surveys

Addis Ababa, 21-30 September 1981

PROBLEMS OF SURVEY DESIGN

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I. INTRODUCTION

1. The National Household Survey Capability Programme (NHSCP) of which the African Household Survey Capability Programme (AHSCP) is a regional component envisages a continuous and co-ordinated series of national household surveys to generate integrated data over time on a wide range of subjects. NHSCP is aimed to be cost-effective as the unit cost of an individual survey in a continuing programme will decrease and the quality of data will also increase in the long run. To satisfy the objectives of NHSCP, the survey design plays an important role.

II. HOUSEHOLD AND HOUSEHOLD SIZE

2. By the United Nations[1/] Principles and Recommendations for Population and Housing Censuses, a household may be either:

(a) a one-person household, that is, a person who makes provision for his or her own food or other essentials for living without combining with any other person to form part of a multi-person household, or

(b) a multi-person household, that is, a group of two or more persons living together who make common provision for food or other essentials for living.

The persons in the group may pool their income and have a common budget to a greater or lesser extent; they may be related or unrelated persons, or a combination of both.

3. It further defines households in terms of living quarters: "Households usually occupy the whole, part of or more than one housing unit but they may also be found living in camps, boarding houses or hotels or as administrative personnel in institutions, or they may be homeless".

4. The above definition, although broad, will not cover all types of African households with complex living and eating arrangements among husbands, wives, children and relatives. The Economic Commission for Africa[2/] defined the household as follows: "A household is defined as a person or group of persons who live and eat together". This basic concept has proved a difficult one for many African countries. Attempts to adapt it to suit local conditions have met with varying degrees of success.

5. One such attempt to adapt the concept of the household as a socio-economic unit to the conditions of a country was made in the 1970 census of Ghana. The definition used is quoted in full below to illustrate the type of adaptation which African countries can make to the general concept. The definition was as follows:

> "A household consists of a person or a group of persons who live together in the same house or compound, share the same house-keeping arrangements and are catered for as one unit. It is important to remember that members of a household are not necessarily related (by blood or marriage) because maid-servants may form part of a household. On the other hand, not all those related in the same house or compound are necessarily members of the same household. Two brothers who live in the same house with their wives and children may or may not form separate households depending on their catering arrangements. The same can be said of a father and his married children. Thus in many cases a house or compound may be broken up into separate households".

1/ United Nations Principles and Recommendations for Population and Housing Censuses, New York, 1980 (Sales No. E.80. Vol. 8).

2/ "Household data requirements" E/CN.14/SM/22, Working Group on Organization, Content and Methodology of Household Surveys, Addis Ababa, 15-19 October 1979.

The examples are provided as guidelines in deciding who should form a household in the ECA document referred to above. It should be stressed that, whatever definition of household is used, it should preserve the convenience of recording and ensure complete coverage.

6. Another problem is whether to use a de jure approach or a de facto approach in defining a household size. By the de jure approach a household will consist of all household members who are normally residents of that household (within specified time limits) regardless of whether they are present at the time of data collection. By the de facto approach, a household will cover all household members and the visitors or guests present at the time of data collection.

7. When the de jure approach is used, in surveys with repeated visits, household size will be relatively stable and will have a realistic relation with income. However, this approach may not be able to show the **per capita consumption** of food.

8. When the de facto approach is used in the surveys with repeated visits, household size will vary from one visit to another which can be recorded by it. The de facto approach will be more suitable in evaluating actual consumption of food. It appears that both approaches have advantages and disadvantages.

9. The Handbook of Household Surveys[3/] proposes "The de jure procedure is generally considered preferable in a continuing survey programme, especially where the enumeration is spread over a considerable period of time. Temporary movements of the population in such a situation are less likely to result in omissions or duplications than they would under a de facto approach. In addition, certain kinds of household information such as household size and composition, household incomes and expenditures, etc., are more meaningful analytically under a de jure procedure, since the data reflect the more permanent or usual situation. The de facto approach is considered most suitable when the enumeration is compressed into a very short period or highly transient groups such as homeless persons or nomads".

III. SAMPLING UNITS AND FRAME

10. At the planning stage before formulating a sample survey design, it is necessary to investigate the availability of frames in the country. A sampling frame consists of a list of sampling units or maps of area sampling units covering the whole country or place to be surveyed with proper identification and demarcation.

3/ United Nations, "Handbook of Household Surveys"(revised draft), Introduction and part one, General survey planning and applications, 1981, p 34.

11. In general, the sampling units in household surveys are of a hierarchical nature starting with households as the elementary or ultimate stage units, segments or clusters of households as sampling units in the next stage and census enumeration areas or administrative areas as sampling units at higher stages. The elementary sampling unit is part of a segment which again is part of a higher stage sampling unit and so on. Some surveys use sampling units of more or less stages depending on the available resources and objectives. The types of units will also depend on type of survey, eg., holdings or farms will be used as sampling units in agricultural surveys. The set of sampling units covering all the areas of focus is called the population represented by the sampling frame.

12. Almost all countries have lists of administrative areas such as districts, towns and villages. Maps of these areas defined or definable on the ground are usually available but some are probably out of date. Similarly if a population census has been based on maps of enumeration areas (EAs) with proper boundaries, this information should be available. For these areas, population, number of households or dwelling units and related information may be available through census or administrative records. But if there is a time gap between the last census and the surveys to be initiated, then the maps and information will need updating.

13. Since the frame is essential to prepare a proper survey design, it is highly desirable to update the available frame at the planning stage to ensure that the maps or lists in the frame are accurate and identifiable, covering the whole survey area with no overlapping or omission. However, it would be too expensive to prepare a frame of elementary sampling units such as households over a large area. The work would take too long and turn out to be full of defects.

14. If the survey design involves multistage sampling, the frame of sampling units can be set up in stages. The first frame will cover only the primary sampling units in the first stage and the frames in the second stage will consist of only the secondary sampling units belonging to the selected primary units and so on. In this way cost of establishing the frames will be reduced significantly and moreover these frames will be more reliable. This is one of the reasons for applying multistage sampling in many surveys.

15. In countries where recent population censuses have been based on EA maps, a geographical frame with supporting information should be readily available after some up-dating. However, this is by no means the standard situation as the following examples will illustrate.

16. One African country had taken a successful census with good EA maps five years before planning the first round of its survey programme. All that was necessary was to revise some urban EAs to take into account road construction and new buildings and make corresponding modifications to the related estimates of population and households.

17. A few cases have been found where lack of a previous census or absence of proper EA mapping has made it necessary to start with administrative areas in constructing a frame. In one of these countries intensive work in establishing urban and rural community associations has resulted in a very satisfactory sampling frame. In another the largely unmapped census EAs were invalidated by a change in local government structure; the new local units provided a satisfactory sampling frame although it was difficult to obtain reasonable estimates of their populations and numbers of households.

18. At the other end of the spectrum are cases where the original census EAs have remained largely undisturbed but there have been changes in the administrative districts used as primary units. In countries where this has happened there has been no serious difficulty in producing an effective sampling frame.

19. In general it can be concluded that the establishment of geographical sampling frames in African countries is not a particularly difficult process, but there are no set rules for the exercise because the situation in individual countries has to be taken fully into account. The one common factor is that the work is much easier in countries where a careful census mapping operation has been undertaken. This is why many countries now believe that it is worthwhile keeping EA maps continuously updated.

20. A special problem arises in enumerating nomadic populations becuase they are only partially related to the geographical frames discussed above. Nomads normally require separate sampling arrangements and there are many methods out of which two approaches based on hierarchical lists of chiefs and sub-chiefs and lists of water-points have been used widely in Africa. The hierarchical approach alone is not satisfactory because the records maintained by chiefs are designed to deal with sensitive matters such as taxation. However the seasonal movement of nomadic groups tends to be reasonably stable and the watering points help to locate them during the dry season. A suitable combination of the two approaches can produce an effective sampling scheme. In each approach the frames of sampling units can be prepared in stages.

IV. STRATIFICATION

21. The designs for sample surveys and especially national surveys are preceded by stratification of the population. Yates[4] explained the purposes of stratification as follows.

> "Stratification has two purposes. The first is to increase the accuracy of the overall population estimates. The second is to ensure that subdivisions of the population which are themselves of interest are adequately represented. Such divisions may be termed domains of study. Maximum over-all accuracy will be attained if the strata are so chosen that the units within each stratum are as similar as possible."

22. It means that stratification of the population is a necessary step taken before the selection of a sample in order to improve the accuracy of over-all estimates and at the same time to get separate estimates for each subdivision designated as a domain of study. The over-all sample will be composed of the samples selected independently from each stratum.

23. Some important points to be observed in stratifying the population are that the units within each stratum are as similar or uniform as possible and on the other hand those belonging to different strata are as dissimilar as possible. If this principle is not strictly adhered to, then the estimates in stratified sampling can be found to be less efficient than estimates in direct sampling.

24. Stratification can be carried out using the available supplementary information related to the subjects to be covered in the surveys and the strata will cover the whole area with no overlapping and omission. It means that all sampling units will be included in one or another stratum but no unit will be allowed to be present in more than one stratum. Since all sampling units in the different stages are featured in the frames of those stages in the form of a list or maps, strata will also appear as groups of sampling units in those frames.

4/ Yates, F., 1960, "Sampling Methods for censuses and surveys" Charles Griffin and Co., London, 24.

25. With respect to sample size and estimation of sampling error, Yates further wrote, "Since in a stratified sample only variation within strata gives rise to sampling error, it is this component of stratification that requires estimation, and this can in general only be done from differences between units in the same stratum. It is therefore necessary if an estimate of sampling error is required, that the strata be of such size that the sample contains two or more units from at least the majority of strata".

26. On the question of the number of strata, many statisticians have made studies using the assumed distributions and actual data. Cochran (1977)5/ showed with examples that generally little reduction in variance is to be expected beyond the number of strata = 6 when over-all estimates are to be made. If the estimates are wanted also for geographical subdivisions (presumably domains of study), the argument for a larger number of strata is stronger. Dalenius (1953)6/ showed by an empiral example that the reduction in variance after a certain number of strata is marginal unless additional stratification characteristics are available and used. Kish (1967)7/ agreed with the above authors but added that perhaps between three and ten strata suffice for a single variable. There are however other statisticians like Sethi (1963)8/ who showed that under gamma distribution the efficiency of stratified sampling with proportional allocation increases in direct proportion to a quadratic function of the number of strata.

27. In the integrated survey programme, many subjects will be covered, for which the population can be divided into strata by multiple stratification in either the first stage or later stages. But the number of strata in the first stage will be limited by sample size since at least two units should be selected out of each stratum except in unavoidable cases. It has also been indicated that formation of many strata will not necessarily lead to appreciable increase in the efficiency of estimates. Therefore a few characteristics related to the main subjects should be used for stratification in the first or later stages.

28. In practice, when multistage sampling is to be applied, the population may not need to be divided into many strata in the first stage. It can be divided into regions and urban and rural areas. In each region or all over the country the urban areas can further be divided by size of population and by economic importance, and rural areas are stratified by geographical or agricultural conditions. The strata so formed will most probably constitute domains of study.

5/ Cochran, W.G., Sampling Techniques, third edition, Wiley, (1977) Sec. 5A8.

6/ Dalenius, T., Multivariat Sampling Problem, Skad. Akt. (1953) 36, 92-122.

7/ Kish, L., Survey Sampling, Wiley, (1967) Sec. 3.6.

8/ Sethi, V.K., A note on optimum stratification of population for estimating the population means. Australian Journal of Statistics, (1963) 5, 20-33.

29. In the later stages of a survey sub-stratification can be carried out in more detail using the supplementary information collected in the course of forming sub-units. It means that stratification should be planned and carried out at suitable stages of sampling. The other problems encountered in stratification are demarcation of boundaries between strata and allocation of sample into strata.

30. When the units are to be stratified using a quantitative variable such as population size or crop production, it will be necessary to study the frequency distribution of such a variable and fix the number of strata to be formed. One method due to Delenius and Hodges (1959)[9] was to find the square root of the frequency and create the equal intervals within the cumulation of such roots. The boundaries corresponding to such intervals will provide the boundaries of the strata. This method is applicable when there is a fairly large number of units to be stratified to get a proper distribution of units.

31. There are other methods suggested by several statisticians for demarcating strata boundaries. Sethi[10] tabulated the optimum boundaries for normal and various χ^2 distributions under different allocations of a sample when the number of strata is less than seven. One drawback of this method is that the number of units to be stratified must be large in order to approximate the above distributions.

32. In practice the boundaries of strata in the first stage are fixed in such a way that the values of variables in a stratum are similar generally but as proximate as possible. It means that stratification in the first stage will not be very thorough or detailed. However in the later stages, more refined stratification can be introduced using supplementary information closely related to the major subjects to be surveyed. Experiences in stratification in some developing countries are as follows.

33. In an income and expenditure survey of an African country the whole area was first divided into urban and rural strata. The households in the penultimate stages were listed and visited to collect some basic information including income of individual household members and household income from agriculture and other enterpreneurial activities using special forms. The enumeration records were sent to the headquarters where the households were divided into three sub-strata separately for the urban and rural strata. The sub-stratum boundaries for the urban and rural areas were fixed so as to allocate equal share of total cash income to each sub-stratum and households were selected. This is a case of two-phase sampling applied in the penultimate stage.

34. In another country for the integrated survey, the rural area is first divided into ecological zones and each selected sub-district (arrondissement) is divided again into rural and urban areas. The households in the selected segments in the penultimate stage are listed and their income and the related variables such as ownership of land, livestock and other assets are recorded. Then the households are stratified or arranged in order of values of such supplementary information and some are selected. This is a two-phase sampling.

9/ Delenius, T. and Hodges, J.L. Jr., "Minimum variance stratification"Journal of the Amer. Stat. Assoc., 1959, 54, p 88-100.

10/Sethi, V.K., op. cit.

35. In one country[11] to conduct a [illegible] survey in a rural area, the villages were first stratified on the basis of their location. The selected villages were visited and all available data including the occupation of members were collected from all the households which were then substratified by main occupations (i.e., occupation with highest income of the household) such as farmers, tenants or farm labourers, government employees, animal husbandry or fishing and others.

36. For the rural income distribution survey of an African country,[12] the rural population was divided into two non-overlapping sampling frames, one consisting of employees of freehold farmers whose annual incomes were available from official records and the others whose incomes were not available. To survey the second group, a division was first made between more and less densely populated areas. All the households in the penultimate stage were interviewed, listed and sub-stratified. The first substratum consisted of households with 30 or more head of cattle, the second substratum consisted of households with fewer than 30 head of cattle and with no additional dwelling place outside the village. The third substratum contained the remaining households.

37. In an African multipurpose sample survey[13] the rural areas were stratified into sub-divisions and then the households in the selected sub-divisions were sub-stratified by household class, i.e., owner, tenant, etc.

38. The survey of rural small-scale industrial establishments was carried out in another country[14] by stratifying the villages according to rough measures of the volume of their industrial activity as reported in the agricultural census in the preceding year. The establishments reported were substratified by type of industry such as textile and other activities.

39. Generally the frame of large and medium size industries is available and these are usually stratified by type and size of either production or employment or other important characteristics. Small-scale industries are not properly registered and, even if there is a list, it is subject to frequent changes. Therefore the areas are usually stratified by industrial activities based on the available information and the selected areas are substratified by type and size of industries after listing them.

11/ Myint Tin and Than Toe, "Estimation for domains in multistage sampling", Journal of the Amer. Stat. Assoc., 1972, 67, p 913-916.

12/ United Nations, "Sample surveys of current interest", thirteenth report, New York, 1979, ST/ESA/STAT/SER.C/14.

13/ Ibid.

14/ Ibid.

40. Another issue is allocation of a sample into different strata once the total sample size to be selected is fixed. The common method used is proportional allocation by which the sample is allocated in proportion to size of strata. The second method is optimum allocation. The second method is more effective in minimizing sampling error at a given cost of survey or minimizing cost at a specified limit of sampling error. To achieve these, a larger sample will be chosen from a stratum (a) if stratum size is large; (b) if variability of the main characteristics is high in that stratum; and (c) if the cost of sampling of a unit including cost of travel between units in that stratum is low.

41. In integrated surveys stratified sampling with optimum allocation can be applied in a judicious way. Since many subjects will be covered in each survey cost as well as variance will change. The method of allocation becomes more complicated if multistage and multiphase samplings are applied, for which cost and variation or intracluster correlation at every stage and every phase will have to be taken into consideration. Another point to be observed in relation to allocation is the amount of data on a subject expected to be obtained from each stratum when it is to be treated as a domain of study. This point is important when events investigated are likely to be small in certain areas. But pilot surveys and previous surveys can furnish the necessary information for optimum allocation and hence serious efforts should be made to reduce survey cost at a desirable level of precision by improving the design after each survey. This will make integrated surveys cost-effective, which is a major aim of NHSCP.

42. In fact the experience of many African countries shows that stratification is not really very difficult and most of them do stratification in the first stage (by area) and the penultimate stage (using supplementary information).

V. SURVEY DESIGNS

43. The objective of the sample survey design is to obtain the most reliable estimates at a specified cost or to obtain the estimates with specified level of precision at a minimum cost.

44. The reliability of estimates are assessed by sampling and non-sampling errors. Sampling error is measured by the expected value of the square of the difference between an estimate and the corresponding population value. It is equivalent to the variance of estimate and the square of bias if it exists. Therefore, sampling error is present in all sample surveys at least in the form of variance of estimate whenever sample size is less than the population size. However it can be measured only if the sample is selected at random by assigning probability of being selected to all sampling units.

45. On the other hand non-sampling errors occur in executing censuses or surveys at various stages such as planning, data collection, tabulation and printing. Errors at the planning stage arise from a defective frame and concepts and definitions in the questionnaires. Those in data collection appear in the form of coverage and content errors, owing to faults and failures in organization, field staff and respondents. Errors in tabulation and printing arise in editing, data preparation, processing and printing.

46. The cost of a survey includes expenditure on preparation, data collection and processing. Hence the cost consists of:

(a) overhead costs;
(b) cost of survey of a unit in each stratum and stage; and
(c) data processing.

47. Sample designs applied in most surveys are stratified multistage sampling with possible sub-stratification. Strata or sub-strata may represent domains of study or just mere divisions to make design efficient by covering all sub-divisions in the sample.

48. Some reasons for multistage sampling have been given in section III, the major ones being to:

(a) Save costs in constructing or updating the frame;
(b) Save cost and time of travelling between the penultimate units and households in them;
(c) Control non-sampling errors by better supervision and organization of field staff who are assigned to the small areas of the selected primary sampling units.

49. On the other hand considerable time is needed to design surveys and list and select units in various stages. Care should be taken at every step to have the work done properly. Multistage sampling is however less efficient than direct sampling and efficiency will generally decrease as the number of stages is increased. But cost of constructing the frames in stages is smaller, and since the households and penultimate units such as clusters of households are confined to some areas only, cost and time of travelling between those units is considerably reduced compared to cost of direct sampling of the same number of households. Another advantage of multistage sampling is that supervisors can manage the enumerators assigned to the units in an administrative unit much more efficiently and frequently so that some aspects of non-sampling errors can be controlled. That may be more difficult when the units and enumerators are spread out in direct sampling.

50. Samples in each stratum in each stage can be selected with equal or unequal probability depending on the sizes of units and available information and resources.

Determination of optimum sample sizes

51. Before discussing survey designs in detail, it will be appropriate to determine optimum sample sizes in a general manner. To simplify the problem, it will be assumed that a stratified two-stage sampling is applied in a country as follows.

52. The country is divided into L strata, N is the number of primary sampling units (PSU) in a stratum, M_i is the number of secondary sampling units (SSU) in the i^{th} PSU, and n and m_i are selected out of N and M_i by probability sampling.

53. Then total error consisting of sampling and non-sampling errors is assumed to be of the form

$$V = \sum^{L}\left(\frac{V_1}{n} + \frac{V_2}{n\bar{m}} + B^2 + n E_1 + n\bar{m} E_2\right) \quad - \quad (1)$$

with summation over all strata and finite population correction ignored.

where $\bar{m}$ = average size of m_i

V_1 = first-stage variation in a stratum

V_2 = average second-stage variation

B = bias which may be nil or a value of any order (i.e., bias in estimate and part of sampling error)

E_1 = non-sampling error of a PSU

E_2 = average non-sampling error of a SSU

Total cost of survey can be described by

$$C = c_o + \sum^{L}(nc_1 + n\bar{m} c_2) \quad - \quad (2)$$

where c_o = overhead cost

c_1 = cost of travelling between PSUs and listing and enumerating all SSUs in a PSU of a stratum

c_2 = cost of survey and processing data of a SSU

54. The optimum values of n and $\bar{m}$ are obtained by minimizing the total error at a specified cost or minimizing the cost at a specified total error as:

$$n = \sqrt{\frac{V_1}{Gc_1 + E_1}} \quad - \quad (3)$$

$$\bar{m} = \sqrt{\frac{V_2}{V_1}} \quad \sqrt{\frac{Gc_1 + E_1}{Gc_2 + E_2}} \quad - \quad (4)$$

where G is a constant. In finding these relations, bias has been ignored.

55. Equation 3 shows that the number of PSUs to be selected from a stratum will be:

(a) directly proportional to the first-stage variation within that stratum, and
(b) inversely proportional to cost per PSU and non-sampling error in the first stage in that stratum.

56. Equation 4 indicates that the average number of SSUs to be selected out of a PSU will be

(a) directly proportional to the second-stage variation, cost of a PSU and first-stage non-sampling error in that stratum;
(b) inversely proportional to the first-stage variation, cost of a SSU and second-stage non-sampling error in a PSU of that stratum.

57. One important point is that since the first-stage variation V_1 is directly related to intracluster correlation of a variable between the SSU of a PSU in that stratum, if the intracluster correlation is high, more PSUs but fewer SSUs will need to be selected.

58. If the non-sampling errors E_1 and E_2 are ignored in determining the sample sizes, then the optimum values of n and $\bar{m}$ will become:

$$n = \frac{(C - c_o)\sqrt{\frac{V_1}{c_1}}}{\sum_{L} (V_1 c_1 + V_2 c_2)} \qquad - (5)$$

$$\bar{m} = \frac{\sqrt{V_2/c_2}}{\sqrt{V_1/c_1}} = \sqrt{\frac{V_2}{V_1}} \sqrt{\frac{c_1}{c_2}} \qquad - (6)$$

59. Equation 5 shows that the optimum number of PSUs to be selected from a stratum will be directly proportional to the square root of variation relative to cost of a PSU in that stratum. In other words the optimum value of n will increase if intracluster correlation is high and cost of a PSU is small.

60. Equation 6 points out that the optimum number of SSU to be selected from a PSU of a stratum will be the square root of ratio of relative variation to cost in the second stage to relative variation to cost in the first stage. It means that $\bar{m}$ will decrease as n is increased and vice versa.

61. To illustrate the determination of values of n and $\bar{m}$ it should be assumed that the units in both stages are selected by simple random sampling and the number of PSUs in the population and the number of SSUs in each PSU are large in order to overlook the finite population corrections and to make the other approximations.

62. Then the ratio of V_2 and V_1 can be approximated by

$$\frac{V_2}{V_1} = \frac{1 - r}{r} \qquad - (7)$$

where r is intracluster correlation in that stratum. Using this relationship, a table of $\bar{m}$ for different values of c_1/c_2 and r is obtained as follows:

Table 1 - Approximate values of $\bar{m}$

r \ c_1/c_2	2	4	8	16	32	64
.1	5	6	9	12	17	24
.2	4	4	6	8	12	16
.3	3	3	5	7	9	13
.4	2	3	4	5	7	10
.5	2	2	3	4	6	8

63. For any value of r, the minimum size of $\bar{m}$ should be at least two. The above table shows that, as the intracluster correlation is increased, the number of SSUs to be selected from it will decrease. On the other hand if the cost of a PSU compared to that of a SSU rises, the number of SSUs to be selected will go up.

64. The optimum value of n can be determined by substituting the necessary values in equation 5. An easier approach is to use a 10 per cent relative margin of error with a confidence probability of 95 per cent assuming a large sample, so that:

$$\frac{s}{b\sqrt{n}} \sqrt{r + \frac{1 - r}{\bar{m}}} \leq 5\% \qquad - \quad (8)$$

where b is a value to be estimated and s is the standard deviation of SSUs in the population. Using this relation the following table of n for various values of r and $\bar{m}$ and for $s/_b$ = 20 per cent is obtained.

Table 2 — Approximate values of n (for $s/_b$ = 20 per cent)

r \ $\bar{m}$	5	10	15	20	25
.1	5	3	3	3	3
.2	6	5	4	4	4
.3	7	6	6	6	6
.4	9	8	7	7	7
.5	10	9	9	9	8

65. These tables show that, as intracluster correlation increases more PSUs but fewer SSUs are to be selected. However, if the number of SSUs ($\bar{m}$) is not less than 10, then almost the same number of PSUs need to be selected for each value of intracluster correlation.

66. These tables are intended for illustration only and for a survey the optimum values of $\bar{m}$ and n should be calculated using the appropriate parameters and approach depending on the main subjects or characteristics of the survey.

Size of clusters

67. In finding the optimum values of $\bar{m}$ and hence n, it will be observed that the intracluster correlation r plays a crucial role. Generally the smaller the size of the cluster the larger will be the value of r and vice versa, since units in a smaller cluster are more likely to be similar to each other than those in the larger cluster. However cost will be high if a larger number of small clusters are to be covered. But the number of clusters to be selected is influenced more by r than $\bar{m}$ for a certain value of $s/_b$ as seen in table 2.

68. On the other hand the precision of an estimate in multistage sampling depends to a large extent on the number of PSUs selected in the sample, since variation between PSUs is greater than those between smaller units.

69. Another important factor to be taken into consideration is coverage of subjects or characteristics in integrated household surveys and the number of classes in which some characteristics are to be presented. It means that the total number of units selected to represent a domain of study should be large enough to satisfy these requirements.

70. Non-sampling errors should also be taken into account in formulating the design and determining the sizes of clusters and samples. If the clusters are large in size the households selected from them can be spread out so widely that interviewers can commit some non-sampling errors out of fatigue from travelling.

71. A pilot survey using a sample of some PSUs and units in the following stages should be conducted to collect information on cost, variances, intracluster correlation and estimates of major characteristics of the survey to be undertaken. If such information from previous surveys is available, it should be exploited to determine the optimum cluster and sample size taking fully into consideration the objectives of survey and available resources.

72. Alternatively, an experiment using different sizes of clusters may be conducted to calculate relative net precision which is inversely proportional to the variance obtained for fixed cost to find an optimum size of cluster as shown by Cochran[15] (1977) for single-stage cluster sampling. Sukhatme[16] produced a table on number of clusters of varying sizes at two levels of cost and another table on relative standard errors, for agricultural surveys.

15/ Cochran, op.cit

16/ Sukhatme, P.V. "Sampling theory of surveys with applications", Iowa State University Press, 1954, p262-3.

73. If more than two stages are involved in the sample design, the penultimate unit will be a cluster and usually of about equal size. Thus it can be arranged in some two-stage sampling also. In practice the size of such a cluster is about 5 to 10 times the number of households to be selected from it so that the households in the sample will be about 5 to 10 households apart from one another if they are selected by systematic sampling. Since the number of households selected from a cluster is usually between 10 and 20, size of a cluster is around 100.

74. This is a convenient size although it may not be the optimum size of cluster as costs and intracluster correlation have not been taken into account.

Sampling with probability proportional to size

75. In the above illustration, stratified two stage sampling in which units are selected by simple random sampling is discussed. In fact if the sizes of PSUs vary appreciably, it is common practice to select the PSUs with probability proportional to size and to select the households (SSUs) with equal probability.

76. If the survey is designed to select the sample in more than two stages using an administrative unit or a group of enumeration areas as a PSU then it is likely that sizes of these PSUs will vary. In such cases it is usual to apply sampling with probability proportional to size or an auxiliary variable of which can result in greater efficiency provided that

(a) reliable values of sizes (or auxiliary variables) are available; and
(b) it is related to the characteristics to be estimated.

77. One drawback in applying sampling with probability proportional to size is that it is tedious to find the estimate and its precision even if the above two conditions are fulfilled. This problem can be solved if the units in the following stages are selected in such a way that the design becomes self-weighting.

78. For instance if three-stage sampling is applied in a stratum or domain of study by selecting a PSU and a SSU with probability proportional to size or a certain scheme then the design will be made self-weighting in the second stage if the product of their probabilities is constant. To make it self-weighting over all stages, a constant fraction of ultimate stage units can be selected with equal probability. Alternatively, the design can be made self-weighting at the last stage.

79. On this question it has been pointed out in E/CN.14/SM/37[17] that by making a design self-weighting data processing and integration of survey results become easier and the summary or advance tables can be prepared conveniently either in the field of regional offices without using a computer. On the other hand the self-weighting design is not as flexible as a non-self-weighting design in allocating units in the later stages and in distribution of workload to the interviewers. Many self-weighting designs end up as non-self-weighting owing to a defective frame and undercoverage of units. If countries can solve such problems in getting summary or advance tables then they might as well opt for non-self-weighting designs. However many countries find data processing a big constraint and therefore some countries try to develop

17/ "Survey designs of four countries under African Household Survey Capability Programme", E/CN.14/SM/37, ECA, Working Group on Organization, Content and Methodology of Household Survey, Addis Ababa, 29 June - 3 July 1981.

self-weighting designs by making the probability of selection of penultimate units constant and selection of a constant fraction of ultimate units. Integration is also an added attraction for self-weighting design, since it is easier to analyse and integrate data if the units of the same domain are selected with equal probability. However it should be possible to integrate data when non-self-weighting designs are used.

80. Another snag is the allocation of optimum sample size in different stages in a self-weighting design. If the actual sample sizes do not depart significantly from those optimum sizes then a self-weighting design will be satisfactory in that respect.

81. In stratified probability sampling, an estimate of the Harvitz-Thompson type which is shown to be robust by Godambe and Thompson (1977)[18] can be used.

Replicated sampling

82. Sometimes, the sample is divided into groups called replicated sub-samples after selection so that each sub-sample can produce an independent estimate like a jackknife estimate for the domain of study. Thus standard error can be determined easily particularly when the design is non-self-weighting or when ratio or complicated estimates are used.

83. In many cases, sampling is designed before selection in order to have interpenetrating sub-samples by Mahalanobis[19] or replicated samples by Deming.[20] For instance, these can be obtained by selecting two samples of $n/2$ units each to get two replicated samples or by selecting two units out of each $n/2$ strata. In fact many arrangements are possible to get two or more samples.

84. The units can be selected by probability proportional to size if sizes vary significantly and otherwise either by simple random or by systematic sampling.

Reduction of some stages in a survey design

85. Generally a design involving fewer stages will be more efficient, other factors being equal. For instance, assuming a frame of sub-divisions which can be taken as units in a stage, clusters are formed by dividing the selected sub-divisions in the field and selected as units in the following stage. Instead, an alternative method is to assign the number of possible clusters of about equal size in the sub-division in their frame and to select the segments directly with equal probability.

18/ Godambe, V.P. and Thompson, M.E., "Robust near optimal estimation in survey practices". Proceedings of the 41st session, Int. Statistical Institute, volume 4, 1977, New Delhi, p129-146.

19/ Mahalanobis, P.C., "Recent experiments in statistical sampling in the Indian Statistical Institute", Jour. Rug. Stat. Soc. 109, 1946, p 325-370.

20/ Deming, W.E. "Sampling designs in business research", Wiley, 1960.

86. The clusters selected can be located in the respective sub-divisions. Then clusters can be formed in the same way as above and selected clusters are identified. In these two designs, the field work will be done in the same way so that cost and non-sampling error may be about the same. However, although the second design can be more efficient by eliminating one stage of sampling, more than one cluster can be selected from the same sub-division.

87. This is an adaptation of the selection method of Deming[21] but his original method was replication with equal probability.

Repeated surveys

88. In repeated surveys, the sample is usually partially or completely replaced by new units in each round or at equal intervals with a possibility of returning to the old units later. The objective of such a design is mainly to minimise non-sampling errors due to migration or respondents' and interviewers' fatigue in some cases.

89. The sample can be replaced in different ways and at various stages. If the sample is replaced at the first or following stages then the frames at that stage and following stages will need to be updated or revised to select new units to replenish the sample. Hence it will be very expensive and time consuming to replace the sample at the higher level.

90. In one African country, it is proposed to use a replicated systematic sample design with partial replacement in the surveys under AHSCP, by which some households in each round are divided into four replicates of equal numbers of households and two replicates will be replaced every round or year.

91. In another African country, two replicated sub-samples of households will be selected from each penultimate unit by circular systematic sampling and a sub-sample will be replaced every round by a new one selected from the same penultimate unit.

92. Many African countries use quarterly rotating samples in income and expenditure surveys. A proposal has been made to apply the same approach in labour force surveys every quarter.

93. In one African country stratified three-stage sampling was applied in the income and expenditure survey carried out recently. In the urban stratum, some councils were selected in the first stage, two segments were selected from each council in the second stage and households were selected from each segment. Those households in each segment were divided into two sub-segments so that there were four sub-segments in each council. Then each sub-segment was surveyed for a quarter and replaced completely by another in the second quarter and so on.

21/ Deming, W.E., "On simplification of sampling design through replication with equal probabilities and without stages". Jour. Amer. Stat. Assoc., 51, 1956, p 24-53.

94. Kish[22] described a design in which each monthly sample comprised eight equal portions, one brand new. The segments of each portion were in the sample four consecutive months, then out eight months, then in again for four months. He also discussed various estimates used in the rotating sample particularly in relation to the correlation coefficient in successive periods.

Interviewers' bias

95. In order to determine interviewers' bias a sample design such as interpenetrating sub-samples proposed by Mahalanobis[23] can be used. By that method an interviewer is assigned to a sub-sample formed at random to test his bias.

96. Another approach is to allocate the interviewers at random into different clusters in an administrative area or a PSU so that an interviewer is responsible for at least two clusters. An anlysis of variance based on two-way classification can be carried out to test a hypothesis on interviewers' bias. There are other designs of experiments for this purpose.

VI. MASTER SAMPLE

97. A master sample often termed a "master sampling frame" is a sub-population or a sub-frame consisting of units to represent the population and to draw further samples from it as required.

98. Yates[24] wrote "When a number of surveys covering the same population or aggregate of material are likely to be required, it is sometimes advantageous to construct a master sample, from which smaller samples can be drawn as required by means of a sub-sampling scheme. The use of a master sample has a number of advantages. It enables a more accurate, complete and adequate frame to be constructed than could be justified if the frame were only required for a single survey. It simplifies the selection of samples, since in the sub-sampling only the material contained in the master sample has to be subjected to the selection process. It enables supplementary information to be obtained which is of value in improving the accuracy of the various surveys. And it enables surveys on the same material to be so planned that the same units are not selected an excessive number of times for different surveys - a matter of some importance when the information is obtained by response to questionnaires".

99. The advantages of a master sample, in addition to reducing the cost and time of updating and maintaining the frame for successive surveys and improving the accuracy are integration of data from different rounds and use of rotating samples at the lower stage.

22/ Kish, L., op. cit.

23/ Mahalanobis, P.C., op. cit.

24/ Yates, F., op. cit.

100. On the other hand Kish[25] cautioned "Since listings are 'perishable', they become less valuable with time and eventually deteriorate beyond usefulness. Their useful life is limited to some reasonable period which depends on the rate and nature of changes in the population. Within that period, the need for using supplementary procedures, to record additions and other changes, becomes increasingly important with the passage of time. Compact segments, denoting actual areas, automatically reflect changes within their boundaries, and handle these problems better than block listings. Eventually, boundaries, and measures of size of blocks and segments undergo such drastic charges that trying to live with the old lists and maps becomes more troublesome and costly than preparing new ones".

101. It is accepted that a master sample needs to be updated before selecting a new sub-sample and new maps of some areas may be necessary and it is agreed that the master sample cannot last for a long time. But it is hoped to be usable for one cycle of surveys, i.e., about four or five years by accommodating changes in the frame. Then a new master will be prepared for another cycle of surveys if there is a sufficient ground for doing so. If, however, there are enormous changes possibly in some urban areas then perhaps a new master sample may be required for those areas. The approach to be used in constructing a master sample in one African country is described as an illustration.

102. The country is divided into four ecological zones and two cities and each ecological zone is further divided into urban and rural areas for which separate estimates are required. Hence there will be ten domains of study. The population census provided a list of enumeration areas (EAs), their maps, and population and number of households in those EAs.

103. In each ecological zone, an arrondissement (sub-district) will be the first-stage unit and segments of equal size (about 120 households) and households will be second-stage and third-stage units. In the first-stage sample a selected arrondissement is stratified into urban and rural areas and a number of segments is chosen from each stratum by circular systematic sampling to get the second-stage samples. Finally a fixed proportion of households is selected by circular systematic sampling using two independent starting points to get two replicated sub-samples from each segment.

104. The number of units to be selected in each stage is first determined for the smallest zone. Since no prior information on intracluster correlation and variations in each stage and costs is available, it is not possible to determine optimum sample sizes. However, on the basis of the experience of other countries the minimum sample size required is determined for that zone. The sample sizes for the other zones are calculated by raising that sample size by relative population sizes of those zones and the number of segments to be selected is calculated to make the design self-weighting. The main reasons for adopting this design are to reduce costs of transportation, to control some non-sampling errors by concentrating on field teams and rotating the sub-samples and to simplify computation, integration and analysis of data.

25/ Kish, L., op. cit.

105. In a city, the first-stage units are segments of about equal size selected by circular systematic sampling to obtain two replicated samples from each arrondissement. Out of each chosen segment, a fixed fraction of households are selected as two replicated sub-samples by circular systematic sampling using two independent starting points. The number of segments selected from each arrondissement is fixed by proportional allocation and a fixed proportion of households is selected from each segment since the necessary information is not available for better allocations of the sample. The design is self-weighting and suitable for applying rotational sampling.

106. For the formation of segments, a cartographic team will be sent to an EA from which a segment is to be selected. The teams will demarcate the boundary of the EA and list all the households to divide them into segments of about equal size. That team will be controlled and checked by a supervisor to avoid bias. Then a team composed of supervisor and interviewers will visit that EA to check the listing and segmentation and to collect basic information including income and related information of households in the selected segment. This is regarded as a first phase sample and after arranging the households in order of income, two sub-samples of households are selected, which will become the second-phase sample.

107. The master sample will be built up based on the present sample in which 25 out of 132 arrondissements (about 20 per cent) are selected for the present survey from the ecological zones and all arrondissements from two cities. These arrondissements, being well distributed and apparently heterogeneous in some characteristics such as population, crop pattern and other major economic activities, are considered to be fairly representative of the whole country. At the same time these arrondissements have stable boundaries. Therefore they will constitute the first-stage master sample in each ecological zone. The only problem is that if there is a change in urban and rural areas in an arrondissement of the master sample, it needs to be accommodated in the sample. In the second stage the number of segments can be increased or decreased in the list of selected segments depending on the type of survey and resources available. If more segments are to be selected then sizes and boundaries of EAs need to be checked again. At any rate the boundaries of segments should be updated before a new survey is launched. In the urban area since the first-stage master sample comprises the segments, the list and boundaries of these segments will need to be checked and updated more frequently and closely.

108. In the final stage a replicated sub-sample will be replaced by a new one selected by circular systematic sampling, after relisting the households in the selected segment. This will facilitate the integration of surveys and permit control of some aspects of non-sampling error. In the following surveys the sample size at various stages will be adjusted on the basis of the variation, intracluster correlation, non-sampling error and cost.

109. These points constitute merely an outline for the formation of a master sample and the details have to be worked out. Since a master sample is smaller than the total population, it is easier and less expensive to check and update. Basic information on households in the penultimate stage of this sample can be collected and updated from time to time so that a form of data base and a kind of time series can be established and the results of surveys can be linked and analysed in depth.

VII. CONCLUSION

110. There are many problems in survey designs and only some are dealt with in this paper. The objective of sample survey design is to obtain the most reliable estimate at a specified cost or to obtain the estimate with a specified level of precision at a minimum cost. It is not easy to attain this objective when the subjects to be covered or the characteristics to be estimated are numerous under AHSCP and NHSCP. An additional objective of survey design is the integration of data of the same survey and of different surveys.

111. The importance of constructing reliable frames in stages is stressed and problems are posed in the concept of households and household size. Stratified multistage sampling is presented as a possible design for construction of a master sample and to produce estimates for domains of study. Stratification has been described in detail showing that it can be carried out in stages particularly in the primary and penultimate stages. An approach to reduce the number of stages is also described. The optimum sizes of clusters and size of samples at different stages are discussed using two-stage sampling as an illustration. The sampling schemes with partial replacement or rotating samples for repeated surveys to control some aspects of non-sampling errors are also discussed, along with some methods of allocation of interviewers to test their bias.

112. Data processing is one serious bottleneck encountered by many African countries so that a decision needs to be taken as to whether the survey design would be self-weighting or not given its advantages and disadvantages.

113. Since many African countries have carried out censuses and surveys and plan to undertake more of them, the problems in survey design can be overcome. There are common problems as well as specific problems for particular countries and surveys. Countries should therefore develop their survey designs depending on their needs, conditions, experience, available resources and subjects to be covered. This paper may perhaps be of some help in developing such designs.

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Distr.
LIMITED

ST/ECA/SH/9
4 August 1981

Original: English

UNITED NATIONS

ECONOMIC AND SOCIAL COUNCIL

ECONOMIC COMMISSION FOR AFRICA
Seminar on Household Surveys
Addis Ababa, 21 - 30 September 1981

ECA/NAIROBI

RELATIONSHIP OF HOUSEHOLD SURVEYS WITH OTHER SOURCES OF DATA

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M81-3058

Introduction

1. With the launching of the African Household Survey Capability Programme (AHSCP) and its global variant, the National Household Survey Capability Programme (NHSCP), it is opportune to examine the relationship of household surveys with other sources of data not only from the point of view of organizational arrangements but also from the perspective of the types and scope of data which can be collected from all these sources. With this framework it is possible to consider the optimal allocation of resources to the various sources so as to enhance the nature and extent of the information collected. It is thus necessary for national statistical offices to view all sources of data in their entirety rather than focusing on only one of them.

2. The ECA Statistics Division, therefore, usually advocates the formulation of an over-all statistical development programme in which censuses, surveys and the use of administrative records for statistical purposes play their relevant roles. It is only after this over-all programme has been defined that the more detailed consideration of the constituent parts can be effectively tackled. Overemphasis of any of these parts to the detriment of any of the remainder may result in an unsatisfactory and unacceptable balance of statistical activities.

Main sources of statistical data

3. It is usual to distinguish the following sources of demographic, social, economic and environmental statistics: censuses, household surveys, other surveys and administrative records. However, the differences among these types are not always unambiguous. For example, an agricultural census is usually based on a sample approach and thus does not differ in its operational framework a great deal from an agricultural survey, although with the typology used by international organizations, the types of data collected in an agricultural census may be different from that collected in an agricultural survey (see annexes I and II for details of items for investigation in population and agricultural censuses).

4. In general the term "census" is used to cover complete enumeration of the relevant statistical units, although as explained above, an agricultural census does not necessarily imply an enumeration of all agricultural holdings. The types of censuses commonly conducted by national statistical offices are those involving population, housing, agriculture and industries. The periodicity is usually 10 years, although in a few countries a periodicity of five years is attempted.

5. Household surveys encompass a whole range of surveys in which the household is the unit of inquiry. As indicated in the document E/CN.14/SM/22 on household data requirements, household surveys can cover the following subject fields:

Demographic characteristics
Household income, consumption and expenditure
Labour force (employment, unemployment and underemployment)
Health, nutrition, housing, water supply, education, literacy and access to related services
Food consumption
Household enterprises (agriculture, handicrafts, trade, transport, etc.).

The above is only an illustrative list which can be amended in the light of priorities within each country.

6. The third source of statistical data has for convenience been classified as "other surveys". These surveys are those in which the unit of inquiry is not the household. Examples of other units which are frequently used are the holding and the establishment. Agricultural surveys may be examples in which the holding is the relevant statistical unit while manpower and industrial surveys are examples of establishment-wise surveys. In surveys on prices, the relevant unit is stopping the outlet.

7. Finally, the fourth main source of statistical data is the administrative record. Data already collected usually by organizations other than statistical agencies can be exploited by the statistical office to obtain statistical information. Organizations like the Ministry of Education, the Ministry of Health, customs and excise, income tax departments, social security administrations, registry of births and deaths collect information which can be exploited to obtain education and health statistics, external trade data, information on income distribution, usually from the formal sector, and vital statistics.

Types of data collected

8. Each data source performs a different function. A population census by its very nature will be restricted in the scope of questions than can be investigated while the population (or demographic) survey can be more flexible and extensive because it is based on a subset of the population. By using the more flexible approach of multi-phase sampling, topics requiring different levels of precision can be investigated in different phases of the survey. The World Fertility Survey with its rather extensive questionnaire is an illustration of the more detailed investigations possible in a survey.

9. In this context, therefore, censuses can be viewed as providing an instantaneous picture of the conditions being investigated at a given point in time. The household surveys as envisaged under AHSCP on the other hand, as continuing programmes not only update this information but provide an opportunity for much more detailed investigations than are possible in the census.

10. The United Nations draft Handbook of Household Surveys[1/] summarizes certain principles by which the household survey approach may be the preferred mechanism for meeting the requirements of the over-all statistical plan. These are:

"(a) When census information is out of date or in insufficient detail for planning or other purposes or does not cover the topics needed;

(b) When other continuous sources such as administrative records are incomplete or non-existent or are not conceptually compatible with the data requirements;

(c) When certain analytically important relationships (such as household and family relationships, determination of household income, etc.) must be explored, which are not normally revealed in other data systems, even when they exist;

(d) When the level of detail in geographical or subject-matter terms is such that statistically reliable information can be obtained using the sample size that can be funded and given available manpower and other necessary resources.

(e) When the subject-matter can reasonably be obtained from a household survey respondent."

11. Other surveys, using units other than the household, provide data complementary to those provided by the household survey. This distinction between the household survey and other surveys is best illustrated in the agricultural field. The following are the main types of data obtainable from agricultural surveys using the household as a unit of enumeration:

(a) Food consumption and nutrition.

(b) Disposal and utilization of produce.

(c) Storage at household level.

Agricultural data obtainable from statistical units other than the household (i.e. other surveys) are the following:

(a) Basic agricultural statistics usually obtained from agricultural censuses (see annex II);

(b) Current agricultural statistics (acreage, yield and production, etc.)

(c) Other agricultural information (farm management, fisheries, irrigation, forestry, prices at various levels and supply, storage and distribution systems).

It should however be noted that components of (a) and (c) (e.g. production and farm management) can be investigated through households. Thus it can be seen that, with data from only one source the picture of agricultural development and conditions is only partial. With information from the two sources, the picture is almost complete.

1/ United Nations Department of Technical Co-operation for Development and Statistical Office, Handbook of Household Surveys, part one, United Nations, New York.

12. The missing link in the picture given by censuses, household surveys and other surveys is provided by the administrative record. Not all data compiled in administrative records are required for statistical purposes. Annexes III and IV show information in respect of civil registration collected by Ghana on the statistical form and the legal record respectively. Some of the information such as names of father and mother together with their nationality is usually used for legal purposes. The statistician is more interested in the place and date of birth, age of mother, parity, etc. Some of this information is not required by the registration authorities. Thus in a number of countries two sets of forms have been evolved: one to satisfy the legal requirements and the other for statistical purposes.

13. It is not however always possible to persuade the administrative authority to use two sets of forms although the single form usually issued is limited in scope. In addition, since records are usually completed in respect of individuals, it is not possible to relate them to the characteristics of households or even household members, thus limiting their analytical usefulness. Another point worth noting is that in Africa even when these records exist, they are usually incomplete and seriously inaccurate, which renders their usefulness for statistical purposes rather limited. Equally, a number of countries in the region have had income tax records for a long period, but these records do not give an accurate indication of the distribution of income for the target group concerned. The same is true of civil registration records which in most African countries cannot be used to estimate vital rates, unless the administrative records are supplemented by a household survey with estimates of the type based on the Chandrasekeran-Deming formula being derived. The foregoing should not, however, be construed to imply that in this region administrative records are useless for statistical purposes. In the field of external trade they provide the only reliable source of information, although even in this area defects in the data relating to trade across land frontiers affect the quality of the information collected.

14. In spite of defects in data derived from administrative records prevalent in the system in Africa, an improvement in the methods of record-keeping could eliminate the need for some of the data now collected from other sources. For example with an efficient civil registration system similar to the one existing in Mauritius, some of the investigations on births and deaths carried out as part of household surveys could be dropped.

Programming of statistical activities

15. The need to formulate an over-all statistical strategy usually finds expression in the statistical development plan. Such plans, apart from considering statistical organization, manpower needs and the budgets have also to focus on priorities and the preparation of a programme of work. The preparation of this over-all programme is an essential function of the central statistical office.

16. In preparing the work programme, the national statistical office has to be realistic and include only elements which can be implemented within the specified period. It is in this context that the timing of surveys which form part of the country s household survey capability programme has to be examined. It is not clear from the national household survey programmes formulated so far whether national statistical offices have taken fully into account their other activities bearing in mind their limitations of funds and manpower. Ideally projects should be formulated in such a way as to show their relationship with other statistical activities clearly.

17. It is only when this is done that the national statistical office can make the initial optimal allocation of the resources available among the different statistical programmes. Changes in the allocation of these resources among programmes and activities will need to be made during the implementation period because the balance between activities changes over time and optimal arrangements may well be different at the various stages of statistical (and national) development. Without careful and comprehensive planning, the initial allocation and subsequent changes will not lead to the expected outputs from the work programme.

Data processing

18. One of the most serious bottlenecks encountered in the timely dissemination of information occurs in data processing. Irrespective of the source of data, delays in processing lead to usually unacceptable delays in publication. One reason for this is that in planning the statistical work programme not much care is taken to estimate its data processing requirements. Thus, it is not unusual to find out that data from the four sources discussed earlier create a backlog at the data processing stage. Realistic planning of the work programme should also include a realistic assessment of the data processing requirements.

19. Such an assessment should include the number and types of data processing personnel required for systems design and analysis, programming, data entry, data preparation, including editing, and maintenance of equipment. It should also cover equipment requirements, including the availability of at least one back-up system.

20. Since there will be competing claims on the data processing unit, it is important for a users' committee to be set up to co-ordinate the various claims on the computer and to set priorities. It is also important that those in charge of sectional statistical activities and those responsible for the computer work closely together. In all cases and especially for censuses and surveys, it is important for subject-matter specialists to take a keen interest in coding and editing specifications and in certain cases be able to use appropriate software packages.

21. Data processing affects only a small part of the competing claims of household surveys and other data sources on the available resources for national statistical development. However, as stated, unless data from all sources are processed on time, the ability of the statistical office to carry out its functions efficiently will be in doubt. It should also be noted that the use of computer print-outs to speed up the process of printing any form of statistical data goes a long way to cut down delays arising from type-setting.

Analysis of data

22. The question of the interlinking and analysis of survey data from different rounds of the national household survey programme was discussed at the Working Group on the Organization, Content and Methodology of Household Surveys convened in Addis Ababa from 29 June to 3 July 1981. See in this connexion background paper E/CN.14/SM/39 on survey data analysis and the report of the Working Group (E/CN.14/SM/42). The difficulties identified at the Working Group are magnified when attempts are made to interlink data from different sources and to analyse them. One prerequisite for such an operation is the standardization of concepts, definitions and classifications.

23. Care must also be taken in interpreting results since in many cases the target populations may be different. In a normal household survey only private households are studied; institutional households and group quarters are usually excluded. Thus in interlinking results from censuses and surveys care must be taken to ensure that the target populations are the same. If not, it is necessary to determine whether comparisons derived from the two different sources are meaningful. However it is sometimes necessary to aggregate data relating to different target populations in order to get a comprehensive picture. It is also necessary for the analysis to have a suitable conceptual framework in which to consider relationships.

24. Models have been used increasingly to interprete relationships. The Rachue 2/ model on demographic-economic interrelationship is an example of this type of approach. However, a note of caution is necessary. In fitting data from different sources to a model, it is necessary to ensure that these conform to the specifications of the model.

25. While on this subject of interlinking of results from different sources, it should be noted that in many countries an annual report, economic survey or survey of socio-economic conditions is published. This is a simple attempt to link data from different sources for the year under review to describe the performance of the economy. This annual review provides the opportunity for testing the use made of the different types of data generated from the different sources. Unfortunately, most of these reviews do not attempt an

2/ Rodgers, G., Popkins, M. and Very, R. Rachue Philippines. Population, employment and inequality. International Labour Office, Geneva. 1979.

in-depth analysis of socio-economic conditions and the various factors affecting them. As an example of the result of analysis of data from different sources therefore, they are rather defective.

Conclusion

26. In conclusion, the central authority responsible for the planning and implementation of statistical programmes should examine all sources of statistical data, establish priorities and allocate resources in accordance with these priorities. In the master plan of statistical activities, subjects such as the agricultural census and manpower survy which may fall outside the purview of the national statistical office should nevertheless be included in order to present a comprehensive picture of the over-all statistical activities planned for implementation within the country. In this context it may be useful to mention all censuses and surveys planned in household survey projects to obtain a composite picture of planned field activities. For most countries, the population census is indicated in the household survey programme. It is useful to extend this coverage also to agricultural and other censuses.

27. The need for an appropriate mechanism with the necessary structure, manpower, equipment, financial and other resources to implement the statistical programme has come obvious. It is also necessary to emphasize that the central authority, vested with the over-all supervision of statistical activities, should, before formulating or approving the statistical programme, review the type and scope of statistics available in each field, examine the data gaps and study the different approaches which can be used to fill gaps.

28. When there is more than one producer of statistics all the major producers of statistics should be represented on the user-producer committees which are now recommended for the co-ordination of national statistical activities. Collaboration at the international level will also help to improve the quality of statistical data produced.

29. Finally, it is desirable to incorporate the statistical programme encompassing all planned statistical activities in the national development plan so as to ensure careful monitoring and evaluation.

Recommended Topics for the 1980 Round of Population and Housing Censuses

A. Geographic characteristics

* Place where found at time of census
* Place of usual residence
* Place of birth
* Duration of residence
* Place of work
* Total population (D)
* Locality (D)
* Urban and rural (D)

B. Demographic and social characteristics

(i) FOR ALL PERSONS
* Age
* Sex
* Relationship to head of household
* Nationality
Ethnic group
* Survival of parents

(ii) FOR EVERY PERSON AGED 5 YEARS OR MORE
* School attendance
* Educational attainment

(iii) FOR EVERY PERSON AGED 10 YEARS OR MORE
* Literacy
Religion

(iv) FOR EVERY PERSON AGED 15 YEARS OR MORE
* Marital status
Form of marriage
Number of spouses
Age at marriage
Duration of marriage

(v) FOR EVERY WOMAN AGED.... YEARS OR MORE
* Number of children born alive
* Children living
Most recent live birth
* Births during last 12 months
* Deaths during last 12 months

(vi) FOR EACH HOUSEHOLD
Household size (D)
Household composition (D)
Births during last 12 months
Deaths during last 12 months

C. Economic characteristics

* Type of activity
* Occupation
Type of establishment
* Industry
* Employment status
Number of employed persons in household (D)

D. Community-level variables
Source of water supply
Availability of electricity
Availability of primary school
Distance from nearest hospital/clinic/health centre

E. Housing conditions

* Number of houses
* Type of housing unit
* Type of occupancy
* Material of wall
* Material of roof
* Source of water supply
* Source of light
* Source of fuel
* Type of toilet
* Number of rooms
* Bathing facilities

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* Working Group on African Recommendations for the 1980 Round of Censuses of Population and Housing, E/CN.14/CPH/47.

D Derived topics.

Proposed agricultural census items for the 1980 World Census of Agriculture 1/

1. Holding
   - *11 Location of the holding
   - *12 Total area of the holding
   - *13 Number of (non-contiguous) parcels of land constituting the holding
   - 14 Location and area of each of the (non-contiguous) parcels
   - *15 Tenure of land
     - *15.1 Area of the holding owned or held in ownerlike possession
     - *15.2 Area of the holding rented from others
       - 15.21 For an agreed amount of money and/or produce
       - 15.22 For a share of produce
       - 15.23 In exchange for services
       - 15.24 Under other rental arrangements n.e.s. 2/
     - *15.3 Area of the holding operated on a squatter basis
     - *15.4 Area of the holding operated under tribal or traditional communal forms of tenure
     - *15.5 Area of the holding operated under other forms of tenure n.e.s.

2. Holder
   - *21 Identification of the holder
   - *22 Legal status of the holder
     - *22.1 An individual or a household
     - *22.2 Two or more individuals of different households or two or more households
     - *22.3 Corporation
     - *22.4 Co-operative
     - *22.5 Collective
     - *22.6 Government
     - *22.7 Other, n.e.s. (e.g. religious institution, private school, tribe or clan)
   - *23 Name and address of the hired manager (if any)
   - *24 Name and address of the respondent and his relationship to the holder

3. Population and employment
   - *31 Demographic characteristics of each member of the holder's household (starting with the holder)
     - *31.1 Name
     - *31.2 Age
     - *31.3 Sex
     - *31.4 Relationship to holder
   - *32 Characteristics of the type of activity of members of the holder's household (including the holder) at or above a specified age
     - *32.1 For a recent week
       - *32.11 Mainly agricultural work on the holding
       - *32.12 Mainly work off the holding
       - *32.13 Not economically active
     - *32.2 For the agricultural year
       - *32.21 Engaged usually in agricultural work on the holding
         - *(a) Permanent
         - *(b) Occasional
       - *32.22 Usually working off the holding
       - *32.23 Not economically active

1/ Programme for the 1980 World Census of Agriculture FAO Statistics Series No.1 FAO, Rome, 1976.

2/ The abbreviation n.e.s. used throughout the Programme means "not elsewhere specified."

* Items which are considered essential for national and international purposes.

*33 Number of hired permanent agricultural workers on the holding other than members of the holder's household
33.1 Males
33.2 Females
*34 Indication of the utilization of hired occasional agricultural workers on the holding other than members of the holder's household
*34.1 Utilized
*34.2 Not utilized

4. Land use

*41 Arable land
*41.1 Area under temporary crops (excluding temporary meadows)
41.11 Area normally irrigated
41.12 Area normally not irrigated
*41.2 Area under temporary meadows for mowing or pasture
41.21 Area normally irrigated
41.22 Area normally not irrigated
*41.3 Area temporarily fallow
*41.4 Area under all other arable land n.e.s.
*42 Land under permanent crops
42.1 Area normally irrigated
42.2 Area normally not irrigated
*43 Land under permanent meadows and pastures
43.1 Area normally irrigated
43.2 Area normally not irrigated
*44 Area of wood or forest land
*45 Area of all other land n.e.s.

5. Crops

*51 Temporary crops
*51.1 Cereals harvested for grain
*51.11 Wheat
(a) Winter wheat
(i) Hard wheat (including durum and semihard wheat)
(ii) Soft wheat
(b) Spring wheat
(i) Hard wheat (including durum and semihard wheat)
(ii) Soft wheat
*51.12 Rice
(a) Wet land (lowland)
(b) Dry land (upland)
*51.13 Maize (corn)
(a) Hybrid maize
(b) Ordinary maize
*51.14 Barley
(a) Winter barley
(b) Spring barley
*51.15 Millet and sorghum
(a) Millet
(i) Finger millet (e.g., pearl millet, bulrush millet)
(ii) Other millet (e.g., bajra, Japanese millet)
(b) Sorghum (e.g., jowar, Guinea corn, durra)
*51.16 Oats
*51.17 Rye
(a) Winter rye
(b) Spring rye

51.18 Mixed cereals for grain (e.g., maslin)
51.19 Others n.e.s. (e.g., buckwheat, quinoa, spelt, teff)

*51.2 Tuber, root and bulb crops
*51.21 Potatoes
*51.22 Sweet potatoes
*51.23 Cassava (manioc, tapioca)
*51.24 Yams
51.25 Arrowroot
*51.26 Dry onions
51.27 Dry garlic
*51.28 Taros (cocoyams, dasheen, edoes, tannia)
51.29 Others n.e.s. (e.g., arracacha)

*51.3 Leguminous plants mainly for grain (excluding soybeans and groundnuts)
*51.31 Edible dry beans
51.32 Dry broad beans (horse beans)
*51.33 Edible dry peas
51.34 Chick-peas (gram)
51.35 Lentils
51.36 Cowpeas
51.37 Pigeon peas
51.38 Vetches
51.39 Others n.e.s. (e.g., lupines, fenugreek, bambarra nuts)

*51.4 Crops mainly for industrial purposes
*51.41 Sugar crops
*(a) Sugarcane
*(b) Sugar beets
(c) Others n.e.s. (e.g., sweet sorghum)
*51.42 Oilseed crops
*(a) Groundnuts (peanuts)
*(b) Soybeans
(c) Flax (linseed)
(d) Sunflower
(e) Rapeseed (colza)
(f) Mustard
(g) Sesame
(h) Cottonseed
(i) Safflower seed
(j) Castor beans
(k) Others n.e.s. (e.g., hempseed, poppy seed, niger seed)

51.43 Spices, condiments, aromatic and medicinal plants
(a) Dry peppers, pimentos or chillies
(b) Oil plants for essence (e.g., geranium, lavender, mint)
(c) Medicinal plants (e.g., opium, liquorice)
(d) Others n.e.s. (e.g., aniseed, caraway seed)

*51.44 Fibre crops
*(a) Cotton
(b) Flax for fibre
(c) Hemp for fibre
*(d) Jute
(e) Others n.e.s. (e.g., sunn hemp, kenaf, urena)

*51.45 Other industrial crops
*(a) Tobacco
(i) Flue-curred
(ii) Other types
(b) Chicory
(c) Pyrethrum
(d) Others n.e.s. (e.g., indigo, henna, broom millet, broom sorghum, esparto grass, sugarcane for thatching)

51.5 Vegetables mainly for human consumption
51.51 Leafy or stem vegetables
(a) Artichokes
(b) Asparagus
(c) Brussels sprouts
(d) Cabbage (red, white, savoy)
(e) Celery
(f) Chicory for greens
(g) Chinese cabbage
(h) Cress
(i) Endive
(j) Kale
(k) Leek
(l) Lettuce
(m) Rhubarb
(n) Spinach
(o) Others n.e.s. (e.g., cardoon, fennel, corn salad)

51.52 Fruit-bearing vegetables
- (a) Cantaloupes and other melons
- (b) Chillies (fresh)
- (c) Cucumbers
- (d) Eggplant
- (e) Gourds
- (f) Okra
- (g) Pumpkins
- (h) Squash
- (i) Sweet peppers
- (j) Tomatoes
- (k) Watermelons
- (l) Others n.e.s. (e.g., chayots)

51.53 Root, bulb and tuberous vegetables
- (a) Carrots
- (b) Green garlic
- (c) Green onions
- (d) Radishes
- (e) Red beets
- (f) Rutabagas or swedes and kohirabi
- (g) Turnips
- (h) Others n.e.s. (e.g., celeriac, horseradishes, parsnip, scorzonera, salsify)

51.54 Leguminous vegetables harvested green
- (a) Beans
- (b) Peas
- (c) Others n.e.s. (e.g., broad beans, cowpeas)

51.55 Other vegetables
- (a) Cauliflower and broccoli
- (b) Corn (sweet)
- (c) Others, n.e.s.

51.6 Special horticultural cultivation

51.61 Grown in the open
- (a) Flowers, bulbs and corms
- (b) Ornamental plants
- (c) Others n.e.s.

51.62 Cultivation under protective cover (e.g., glass, plastic)
- (a) Vegetables
- (b) Mushrooms
- (c) Flowers and ornamental plants
- (d) Others n.e.s.

51.7 Fodder crops (for grazing or cut for hay, green feed or silage)

51.71 Leguminous forage crops
- (a) Alfalfa
- (b) Clover
- (c) Others n.e.s. (e.g., lespedeza, sainfoin, soybean hay)

51.72 Grasses
- (a) Grown alone (e.g., timothy, red top, orchard grass, Sudan grass)
- (b) Mixed grasses

51.73 Cereals
- (a) Maize (corn) for silage
- (b) Oats
- (c) Others n.e.s.

51.74 Mixed legumes, grasses and cereals

51.75 Other fodder crops n.e.s.
- (a) Cabbage
- (b) Jerusalem artichokes
- (c) Pumpkins
- (d) Sunflower
- (e) Mangels (fodder beets)
- (f) Sugar beets
- (g) Sugarcane
- (h) Swedes
- (i) Turnips
- (j) Others n.e.s. (e.g., carrots)

51.8 Crops grown mainly for the production of seed
- 51.81 Seed of sugar beet
- 51.82 Alfalfa seed
- 51.83 Clover seed
- 51.84 Rye-grass seed
- 51.85 Onion seed
- 51.86 Others n.e.s. (e.g., trefoil)

51.9 Other temporary crops n.e.s.

52 Permanent crops
- *52.1 Fruit and nut trees
  - *52.11 Citrus fruits
    - *(a) Oranges
    - *(b) Mandarins and tangerines (including clementines and satsuma)
    - *(c) Lemons
    - (d) Grapefruits and pomeloes
    - (e) Sour limes
    - (f) Others n.e.s. (e.g., bitteroranges, sweet limes, citrons, bergamots)
  - *52.12 Pome fruits
    - *(a) Apples
    - (b) Pears
    - (c) Quince
    - (d) Medlars
    - (e) Others n.e.s. (e.g., Loquat)
  - 52.13 Stone fruits
    - (a) Apricots
    - (b) Cherries (including sour)
    - (c) Peaches
    - (d) Plums and prunes
    - (e) Other n.e.s. (e.g., nectarines)
  - *52.14 Grapes
    - (a) Grapes for wine
    - (b) Grapes for table use
    - (c) Grapes for raisins
  - 52.15 Small cultivated fruits
    - (a) Blueberries
    - (b) Cranberries
    - (c) Currants
    - (d) Gooseberries
    - (e) Raspberries
    - (f) Strawberries
    - (g) Others n.e.s. (e.g., blackberries)
  - *52.16 Other cultivated fruits
    - (a) Avocados
    - (b) Bananas
    - (c) Breadfruit
    - (d) Custard apple
    - *(e) Dates
    - (f) Figs
    - (g) Guavas
    - (h) Mangoes
    - (i) Papaws
    - (j) Persimmons
    - (k) Pineapples
    - *(l) Plantains
    - (m) Pomegranates
    - (n) Sapotes
    - (o) Others n.e.s. (eg., litchi, carob)
  - 52.17 Edible nuts
    - (a) Almonds
    - (b) Cashew nuts
    - (c) Walnuts
    - (d) Chestnuts
    - (e) Hazelnuts (filberts)
    - (f) Others n.e.s. (e.g., pecan, pistachio nut, Brazil nut, Macadamia (Queensland nut), but excluding coconut)
- *52.2 Permanent crops mainly for industrial purposes
  - 52.21 Beverage crops
    - *(a) Coffee
    - *(b) Cocoa (cacao)
    - *(c) Tea
    - (d) Hops
    - (e) Yerba maté
    - (f) Others n.e.s. (e.g., cola)
  - *52.22 Oil crops
    - *(a) Coconut
    - (b) Oil palm
    - *(c) Olive
    - (d) Others n.e.s. (e.g., tung trees, shea butter trees)
  - 52.23 Spices and aromatic crops
    - (a) Black pepper
    - (b) Cinnamon
    - (c) Cloves
    - (d) Ginger
    - (e) Nutmeg and mace
    - (f) Vanilla
    - (g) Cardamon
    - (h) Others n.e.s. (e.g., drumstick)

52.24 Fibre crops
(a) Abaca (Manilla hemp)
(b) Agave plants (e.g., sisal, henequen)
(c) Kapok
(d) New Zealand flax(formio)
(e) Ramie and rhea
(f) Others n.e.s. (e.g.,fiqué maguey)

52.25 Rubber and tanning crops
*(a) Rubber (hevea)
(b) Black wattle
(c) Quebracho
(d) Others n.e.s.

52.26 Flower crops
(a) Roses
(b) Jasmine
(c) Others n.e.s.

52.27 Other industrial crops
(a) Citronella
(b) Mulberry for silkworms
(c) Sago palm
(d) Palmyra palm
(e) Quinine
(f) Areca (betel) nuts
(g) Others n.e.s.(e.g.,lemon grass)

52.3 Nurseries
52.31 Nurseries of fruit trees, nut trees and vines
52.32 Nurseries of permanent industrial plants
52.33 Nurseries of flower trees, ornamental trees, and bushes

52.4 Other permanent crops n.e.s.

6. Livestock

*61 Livestock

*61.1 Cattle
*61.11 Calves under 1 year
61.12 Cattle, 1 year and under 2 years
(a) Males
(b) Females
*61.13 Cattle, 2 years and over
(a) Males
(i) Primarily for draught purposes
(ii) For other purposes
(b) Females
(i) Primarily for milk
(ii) Primarily for draught purposes
(iii) For other purposes

*61.2 Buffaloes
*61.21 Buffaloes, under 3 years
(a) Calves, under 1 year
(b) Buffaloes 1 year and under 3 years
(i) Males
(ii) Females
*61.22 Buffaloes, 3 years and over
(a) Males
(i) Primarily for draught purposes
(ii) For other purposes
(b) Females
(i) Primarily for milk
(ii) Primarily for draught purposes
(iii) For other purposes

*61.3 Sheep
*61.31 Lambs, under 1 year
*61.32 Sheep, 1 year and over
(a) Males
(b) Females

*61.4 Goats
*61.41 Goats, under 1 year
*61.42 Goats, 1 year and over
(a) Males
(b) Females

*61.5 Pigs
*61.51 Under 6 months
*61.52 6 months and over
(a) Females for breeding
(b) Others (including sows for fattening)

*61.6 Horses
61.61 Under 3 years
61.62 3 years and over
*61.7 Mules and hinnies
*61.8 Asses
*61.9 Camels
61.91 Under 4 years
61.92 4 years and over

*62 Poultry
- *62.1 Hens, cocks, pullets and chicks
  - 62.11 Cockerels pullets and chicks under 4 months
  - 62.12 Cocks, capons, hens and pullets, 4 months and over
    - (a) Laying hens
    - (b) Others n.e.s.
- 62.2 Ducks
- 62.3 Geese
- 62.4 Turkeys
- 62.5 Guinea fowls
- 62.6 Pigeons
- 62.7 Others n.e.s.

63 Beehives and bee colonies

64. Other domesticated animals n.e.s. (including those reared in captivity)
- 64.1 Rabbits and hares
- 64.2 Llamas and alpacas
- 64.3 Fur-bearing animals (reared in captivity for fur or skin)
  - 64.31 Foxes
  - 64.32 Minks
  - 64.33 Other fur-bearing animals n.e.s.
- 64.4 Others n.e.s. (e.g., reindeer, zebras, ostriches, elephants)

7. Machinery and equipment

*71 Stationary power-producing machinery
- *71.1 Prime movers
  - *71.11 Internal combustion engines
  - 71.12 Steam engines
  - 71.13 Windmills
  - 71.14 Others n.e.s. (e.g., water wheels)
- 71.2 Electric generators
- 71.3 Electric motors

*72 Agricultural machinery
- *72.1 Tractors
  - *72.11 Tracklaying (crawler) tractors
  - 72.12 Four-wheel tractors
  - 72.13 Power tillers and other single-axle tractors
- 72.2 Ploughs, tillers and harrows
  - 72.21 Ploughs
    - (a) Wooden
    - (b) Iron or steel ploughs operated by animals
    - (c) Tractor-operated ploughs
  - 72.22 Rotary tillers (tractor operated)
  - 72.23 Harrows (rotary or disc)
    - (a) Animal operated
    - (b) Tractor operated
- 72.3 Grain drills
  - 72.31 Hand operated
  - 72.32 Animal operated
  - 72.33 Tractor operated
- 72.4 Sprayers and dusters
  - 72.41 Hand operated
  - 72.42 Animal operated
  - 72.43 Engine operated
- *72.5 Reapers, mowers and binders
  - *72.51 Reapers
    - (a) Animal operated
    - (b) Tractor operated
  - *72.52 Mowers
    - (a) Animal operated
    - (b) Tractor operated
  - 72.53 Binders
- *72.6 Combines (harvesting and threshing)
  - 72.61 Tractor operated
  - 72.62 Self-propelled
- *72.7 Threshing equipment
  - *72.71 Hand operated
  - *72.72 Animal operated
  - *72.73 Engine operated
- *72.8 Milking machinery and equipment
  - *72.81 Milking machines (fixed or movable)
  - 72.82 Milk coolers
  - 72.83 Cream separators
- 72.9 Others n.e.s.

73 Transport equipment
- 73.1 Trucks
- 73.2 Cars jeeps and station wagons
- 73.3 Carts and wagons (animal drawn)
- 73.4 Wheelbarrows
- 73.5 Others n.e.s.

8. Selected practices and facilities

*81 Use of irrigation facilities on the holding
- *81.1 Tubewells or boreholes
- *81.2 Other wells with pumps or irrigation water wheels
  - *81.21 Hand operated
  - *81.22 Animal operated
  - *81.23 Engine operated
- *81.3 Solely by gravitational flow
- 81.4 Other irrigation facilities n.e.s.

*82 Integration of holding with an establishment in another industry
- *82.1 Holding is part of an establishment in another industry
  - 82.11 Part of a manufacturing establishment
  - 82.12 Part of a wholesale or retail trade establishment
  - 82.13 Part of an agricultural services establishment
  - 82.14 Part of an establishment in another industry
- *82.2 Holding is not part of another establishment

*83 Production on the holding under contract for another establishment
- *83.1 Part or all of production (specify products)
- *83.2 None

*84 Use of high-yielding crop varieties on the holding
- *84.1 Wheat
- *84.2 Rice
- *84.3 Others (specify crop)
- *84.4 None

85 Use and application of inorganic fertilizers and pesticides
- 85.1 Fertilizers
  - 85.11 Applied solely by holder
  - 85.12 Applied solely or partly by others
  - 85.13 No fertilizers used
- 85.2 Pesticides
  - 85.21 Applied solely by holder
  - 85.22 Applied solely or partly by others
  - 85.23 No pesticides used

Republic of Ghana - Registration of births and deaths regulations, 1970

FORM A

PRESCRIBED PARTICULARS FOR BIRTH REPORT FORM

I. REGION III. REGISTRATION DISTRICT

V. SERIAL NUMBER IN REGISTER

II. ADMINISTRATIVE DISTRICT IV. REGISTRY/CENTRE

A. CHILD

1. Full name of child _____

2. Sex _____

3. Date of birth _____

4. Type of birth _____

5. (a) Place of birth _____ (b) Hospital _____

Non-hospital _____

6. Attendant at birth (a) Doctor; (b) Registered midwife; (c) Other _____ (Specify)

B. MOTHER

7. Full name of mother _____

8. (a) Nationality/citizenship _____ (b) Tribe _____

9. Age _____

10. (i) Number of children ever born alive (including this birth)

(a) Born alive and now living _____ (b) Born alive and dead _____

(ii) Parity or birth order _____

(iii) Still-born _____

11. Occupation _____

12. Level of formal education attained _____

13. Place and address of usual residence _____

C. FATHER

14. Full name of father _____

15. (a) Nationality/citizenship _____ (b) Tribe _____

16. _____

17. Occupation _____

18. Level of formal education attained _____

D. INFORMANT

19. (a) Name in full _____ (b) Relationship to child _____

I certify the above to be correct _____ Date _____
(Signature or mark)

E. REGISTRAR

Date of registration _____ Registrar's signature _____

Republic of Ghana - Registration of births and deaths regulations, 1970

FORM C

REGISTER OF BIRTHS

REGISTRATION DISTRICT	REGION
AREA	ENTRY NO.

CHILD

1. Name in full (if any) — 2. Sex

3. Date and place of birth

FATHER

4. Name in full

5. Nationality

6. Occupation

MOTHER

7. Name in full

8. Maiden surname

9. Nationality

10. Occupation

INFORMANT

11. Name in full (if not mother or father) — 12. Relationship to child

13. I certify that particulars entered above are true to the best of my knowledge and belief.

_____ Signature of informant

14. Date of registration — 15. Signature of registrar

16. Name registered after registration or change of name *

* A name given to a child (whether in baptism or otherwise) before the expiration of twelve months from the date of the registration of its birth or a change of name of the child within twelve months of the registration may be inserted in space 16 of the birth entry in accordance with the procedure prescribed by section 10 of the Registration of Births and Deaths Act, 1965 (Act 301).

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Distr.
LIMITED

ST/ECA/SM/10
25 August 1981

Original: ENGLISH

UNITED NATIONS

ECONOMIC AND SOCIAL COUNCIL

ECONOMIC COMMISSION FOR AFRICA

Seminar on Household Surveys

Addis Ababa, 21-30 September 1981

ROLE OF HOUSEHOLD SURVEYS IN NATIONAL STATISTICAL SYSTEMS*

(Item 12 of the provisional agenda)

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*This paper was prepared by Mr. H.-L. Mayer, Federal Statistical Office, Federal Republic of Germany. It is presented in its original English version without editing. The views expressed in it are those of the author and do not necessarily reflect those of the United Nations.

LC/NAIROBI

INTRODUCTION

1. The role of household surveys in national statistical systems depends to a considerable extent on the manner these statistics are organized and on the level of development accomplished. The more centralized the statistics, the less difficult it will be to establish uniform concepts, definitions, reference periods, etc. Decentralization of data collection and data processing may have advantages in regard to certain aspects of administration and organization but methodological co-ordination and technical co-operation are more difficult to achieve than in a centralized system. A high extent of collaboration and some kind of mechanism are then required.

2. As these characteristics differ widely among the countries, it is particularly difficult to make statements of general character. The following will consequently refer frequently to a specific system with different and exactly defined household surveys and to a large number of other subject statistics. The statistical system shown corresponds widely to the situation of the official statistics in the Federal Republic of Germany.

3. Chart 3, for instance, presents the organizational implication among the different housing surveys, the Population Census, the Building and Housing Census, the Establishment Census and the Agriculture Census as well as the interplay of the household surveys among each other according to the German overall system.

4. Also the connections among household surveys, other primary statistics and administrative records as they are explained in the different sections of this paper, refer in most cases though implicitly to a certain statistical system. On the other hand nearly all topics of this Seminar are to and will make allowance for the role of household surveys in national statistical systems. It is for this reason that this paper deals merely with examples and partial aspects. As far as mention is made of certain statistics, it will be possible to incorporate those into the general system "Possible courses of reporting" (Chart 2).

NECESSITY OF INTERCENSAL HOUSEHOLD SURVEYS

5. Experience acquired in many countries over the last three decades has shown that the population census and other censuses in their "classical" form of a periodical inquiry held with complete coverage at intervals of five to ten years are insufficient. It is no longer suited to meet the steadily increasing requirements made on official statistics. The reasons for this may be listed under the following two headings:

- Increasing requirements for information
- Changing requirements for information

Changing requirements for information mean both that the needs for up-to-date information on current developments has grown and that the needs for information are subject to more rapid changes.

6. The steadily increasing requirements for information and the changes in the kinds of information needed are generally conditioned by the economic and social development as well as by the population development. The differentiated structure of the society, the dynamic economy, the migration across national frontiers, the high mobility of the population, the strong fluctuation between the various sectors of economy and social strata must be mentioned in this connexion. In order to observe and direct these developments, administration (information for developing and monitoring programmes), economy and science therefore require highly differentiated quantitative material; this must be available at short notice and provide answers to the most topical questions of a given period. The census proves to be a much too unwieldy instrument for this purpose.

7. The increasing and changing needs for information as well as the necessity of up-to-date information have two consequences. First they advance the development and the introduction of statistical methods by which these requirements can be met. These are essentially sampling methods and more or less administrative records and different kinds of registers. On the other hand, the development of such methods offers the advantage to restrict the censuses themselves to the classical characteristics as well as to the major data required in each case in the field of demographic occupational housing and other statistics.

8. Thus it is possible to disencumber the census questionnaire insofar as it has to be answered by all households and all persons. There are two different ways of achieving this aim of which only the second is, however, of interest in the context of the present paper.

9. The first possibility consists in restricting the household schedule to be answered by all households to the major data in the field of demographic occupational housing and other statistics as well as to those needed in a more detailed breakdown. More detailed questions are addressed only to a sample of households.

10. The second possibility is provided by intercensal sample inquiries which follow the census. These intercensal sample inquiries can serve various purposes. They will be discussed in detail in this Seminar.

THE RELATIONSHIP BETWEEN CENSUSES AND A CONTINUING HOUSEHOLD SURVEY (MPS)
(Tasks of the censuses and the Household Survey)

11. We shall now deal with the functioning of the system of intercensal sample inquiries. First we shall briefly explain the tasks of population census and then the "division of labour" which has developed between census and Household Survey.

12. The population census supplies at longer intervals the basic information in the most detailed breakdown for communes and enumeration districts. It also provides highly differentiated material, e.g., the economically active population by sex, age - not only by age groups - and occupation according to about 320 occupational categories.

13. The census therefore constitutes the most important basis for differentiated regional data which are needed for regional planning and other purposes. The census also serves other technical purposes. In many countries it is the basis for the current adjustment of the population and for population sample surveys.

14. The German multi-subject HS (MPS, microcensus Chart 3) as an intercensal sample inquiry has the following tasks:

(a) The MPS and the census control one another
(b) By means of the MPS the results of the census are currently adjusted
(c) The MPS disencumbers and supplements the census
(d) The microcensus represents a current pilot survey for the preparation of the census.

If intercensal sample inquiries are to supplement the census, it is necessary to observe the following points, in order to ensure the comparability of the results supplied by the census and the MPS:

- Date of census or MPS
  (are the sample inquiries conducted at the same data as the census or at a date near to that of the census?)
- Definitions used
- Comparability of the method of data collection
- Sampling frame

15. For this purpose it was necessary to reconcile the wording of questions, the definitions and the classifications of the census and the MPS with each other. The census was moreover used as a basis for the MPS-sample.

16. It was intended to link the census to be held around 1980 even more closely together with the MPS than has already been possible in 1960 and 1970 and to make use of the results supplied by the follow-up surveys of the MPS for the preparation of the census.

(a) The MPS controls the census

17. The last census was taken on May 27, 1970. MPS were held in April and July of the same year. It was possible to check against one another the results relating to characteristics which had been recorded in both enumerations.

18. In order to control the completeness of the census-results, sample checks were made in communes and enumeration districts determined by random selection as a sub-sample of the first stage of the MPS.

19. In order to control the answers relating to major characteristics, the questionnaires of the population census and those of the microcensus surveys of April and July were brought together and checked for consistency.

(b) The microcensus shows the trend

20. Current intercensal sample inquiries provide at longer or shorter intervals intercensal results. The dates and thus the intervals at which these results will be available depend on the system inquiries planned between the different census dates.

21. In the MPS the most important items of demographic and occupational statistics are determined for the Federation and the regions under the basic programme once a year in the 1 per cent sample. On a quarterly basis 0,1 per cent - data were only given for the Federation (till 1974).

(c) The MPS disencumbers and supplements the census

22. Data for which more detailed regional breakdowns are either not necessary or inexpedient can more easily be collected in sample surveys. Pilot surveys for the census have, for example, shown that questions relating to the type and extent of social insurance were answered in a very unsatisfactory way because the legal situation is very complicated. The information provided by respondents on disablement were also very incomplete. These questions were therefore included in the MPS, because there it is possible for the interviewers to advise the respondents and to check to some extent the information given. For legal reasons it was not possible to include questions pertaining to fertility (number of live-born children according to the age of the mother, duration of marriage, etc.) into the census, whereas these subjects could be made part of a 1 per cent survey of the MPS.

23. In addition to the questions which are contained in the basic programme of the microcensus and therefore not repeated in the census, the supplementary programmes also offer a very effective means of disencumbering the census (see §§ 54 f).

INTERCENSAL SAMPLE INQUIRIES WITHIN A SYSTEM OF POPULATION STATISTICS

(a) Current statistics relating to the population

24. If in the framework of official statistics current household surveys relating to the population are introduced, then - generally speaking - a more or less broadly based system of population statistics is already in existence. This sytem mainly consists of the statistics of vital events and migration in connection with the current adjustment of the population. This brings us to the question of the position which intercensal sample inquiries have in such a system. The position and function of the census in connection with intercensal sample inquiries have already been dealt with. In order to describe the whole system, the more important types of statistics in the system of population statistics mentioned before have to be explained briefly.

25. Current statistics recording primarily such events as births, deaths, marriages, arrivals, departures, are the basis for the current adjustment of the population. Thus they are closely inter-related in many ways both with the census and with the MPS.

26. In order to understand the role of the census and the MPS within the system of official population statistics, it is important to know that the population data of the FRG and in countries with similar statistical systems are currently adjusted every month according to sex. The basis for this adjustment are the census results for the individual communes. It is a legal obligation for every person who changes his place of residence to register with the police at the former and the new place of residence. The number of inhabitants of each commune can thus be annually determined by adding births and arrivals and substracting deaths and departures. The results of the current adjustment provide the basis for raising the results of the sample to the total population.

(b) The inter-relationships of the different statistics

27. After a description of the individual statistics the system as a whole will be described. Chart 1 shows in a schematic way the inter-relationships of the intercensal sample inquiries with the census and the current statistics of vital events and migration. Both the census and the microcensus provide information on the number and structure of the population. The current adjustment using information obtained from the statistics of vital events and migration makes possible a permanent observation of the population development, the results of which are also made use for raising the MPS figures. The MPS disencumbers the census and will also supplement the census results (see §§ 22 f).

28. The system of inter-related collection techniques, as it has been described here, must be tailored to measure and adapted to the prevailing situation.

29. It will of course never be quite possible to present a general picture of demographic and social conditions in all their details, the number of the population, the structures and the various changes. If handled with skill, it will however be possible to gather statistically in such a net of different and interpenetrating survey techniques the most relevant developments. This statistical network can be extended for the purposes of social research. Surveys of social research institutes could be based on the address-material of the MPS. The questions covered in these surveys mostly lie outside the framework of official statistics, yet by this method their results could be linked to the results of official statistics (see § 78 and Chart 7 and 8).

30. Chart 1 shows only the linkage of the survey techniques. There are of course very close relationships also with economic and social statistics, as, e.g., with a quarterly observation of the economically active population in the various branches of economic activity and with the recording of the hours worked during the reference week. These are important data for determining the productivity of national economy.

THE RELATIONSHIP BETWEEN POPULATION REGISTERS, ADMINISTRATIVE RECORDS AND HOUSEHOLD SURVEYS

31. Population registers are one outstanding example for the use of computers for administrative purposes. Such registers can at least partly substitute current vital statistics and can be used for population counts at any moment in any regional breakdown. But it should be kept in mind that for statistics only the individual characteristics can be used which are kept in the register.

32. Besides the population registers which contain all inhabitants of a given region in a country other registers are set up for the registration of vital events, migration, etc. The administration aspect of these registers is shown on the left side of Chart 1. It demonstrates the use of civil registration and its interaction with the different tasks of public administration. The current population-register, for instance, incorporates the birth-register, the death-register, etc. The interaction of civil registration with the statistical system of population statistics is shown on the right side of Chart 1.

33. Furthermore registers are kept for special groups of the population. These registers for special groups of the population (e.g., physicians, employees, tax payers) are usually centralized. As far as to the characteristics of the individuals stored in the register they are just as inflexible as the population register.

34. It should be mentioned in this context, that it is necessary, of course, to co-ordinate the tabulation programmes of the statistics based on registers and the programmes of the census, household surveys, etc. Co-ordination means comparable definitions and classifications. The household surveys are much more flexible with regard to the definitions and classifications used. That means: They have to be adjusted to the definitions and classifications in the register (if statisticians are going to compare data from both sources).

35. Household and family statistics are one important part of population statistics, in many countries derived from household surveys. Therefore the question arises to what extent population registers can be used in this respect. This is not impossible, but it depends on the organization of the register and the organization of data input and storage. (If for instance the identification number of every child is stored together with the data of the father's and/or mother's family, family-statistics can be derived from the population-register.) Some information on family-formation and -dissolution can be gathered, if the population-register is linked together with the registration of vital events.

36. With the increasing use of administrative records for statistical purposes the general question arises of the relationship of statistical surveys, and multipurpose sample surveys in particular, to statistical information prepared from administrative records. The answer to this question must take account of the fact that the data on registers and administrative records, if available in a form suitable for automated handling, can theoretically be counted for any possible combination of characteristics at any time. Such counting operations can, however, cover only the characteristics contained in the administrative records or registers, whereas statistical surveys, in particular sample surveys, are flexible with regard to their list of characteristics and can be adapted to any set of questions which happens to be current. This relationship between the inflexibility in the statistical evaluation of registers or administrative records and the flexibility of statistical surveys should in the long-term have an influence on the statistical programme in general and the development of multi-purpose sample surveys on particular, a factor which should be taken into consideration in the planning of sample surveys to a greater extent in the future, both as regards their methodology and content.

37. However one should not think such surveys, however designed, can be regarded as a substitute for well organized administrative statistics. Any public system, e.g., a Health Service or an Employment Service (see Chart 2) will require its own inbuilt system of data recording and collection which enables those responsible for its efficiency to keep control of it and detect the effects of their actions. Sample surveys properly organized should clearly not be used to duplicate such data. They could be used in some circumstances as a substitute for them but their design will rarely make it possible to use them as a control instrument in the same way as administrative statistics derived from the working of the system can be so used.

38. On the other hand one should not think that such continuing multi-subject-surveys however they are organized can be regarded as a substitute for the detailed ad hoc study focussing on one problem and bringing the whole weight of the detailed interview or record to bear on it. For many survey researchers the ad hoc detailed inquiry dealing with a topic of public interest will always seem a more glamorous piece of work in many ways especially where the necessary resources are available (see Chart 2: e.g., special uni-subject inquiries on income and expenditure, housing conditions and facilities, etc.). However, such a survey is in many ways easier to carry out than the continuous multi-purpose survey where an adequate response and a standardised approach must be maintained without the stimulus of new subject matter or the long period of consideration and manipulation of data and reflection which intervenes between data collection and reporting on most single purpose surveys.

STATUS OF LABOUR FORCE SURVEYS IN THE CONTEXT OF NATIONAL STATISTICS

39. Information relating to employment is of importance under two different aspects. At the core of the social and the socio-political approach is the population and its participation in economic activity as broken down by demographic and social characteristics, while under aspects of economic policy it is primarily the production factor labour, and its connection with other economic and social factors, which is of importance. In many countries the system of employment statistics is orientated towards both objectives of investigation and has, as a result of national and international requirements, been steadily expanded. In developing the programme of official employment statistics, special emphasis was placed on ways and means to arrive at a well-balanced programme in material and regional respects, as well as in point of time.

40. In accordance with the demands made on the system of employment statistics, the following three sets of characteristics and groupings can be distinguished:

(a) characteristics and groupings of demographic and educational statistics,
(b) characteristics and groupings of employment and economic statistics, and
(c) characteristics and groupings of regional statistics.

41. Analysed with respect to these three sets of characteristics and groupings are the population census, the microcensus, the new employment statistics, the census of non-agricultural local units, as well as the major statistics pertaining to sectors of the economy. A survey of the characteristics covered in individual statistics shows where common features of coverage do already exist in the various employment statistics (see Chart 4).

42. In order to be able to meet the demands in point of time in connection with the technical and regional requirements, as far as this is methodologically, technically and organizationally feasible (in the FRG) a system was developed for employment statistics by which large scale censuses conducted at larger intervals only, annual statistics and others covering several years, and also the provision of data in the form of short-term current reports, supplement each other. At larger intervals, the observation of employment is performed on a person-related basis in the population censuses, on the basis of the persons engaged as collected via the local units in the censuses of non-agricultural local units and the different enumerations pertaining to individual sectors of the economy, as for example the censuses of agriculture, the censuses of production industries, the censuses of handicrafts, the censuses of distribution, etc. For the person-related current annual reports, the MPS is used, while major short and medium-term statistics with figures on the persons engaged are the industry reports, the

reports on the construction industry, the handicraft reports, wholesale and retail trade statistics, agricultural labour force statistics, etc. Additional material relating to the public sector will also be provided at intervals of one or several years by the new, considerably extended statistics of public service personnel, together with university and school statistics and statistics relating to the public health service. Still existing gaps in the inter-locking system of large-scale censuses and current short and medium-term reports will largely be filled by the new statistics on persons engaged (basis: social security records).

43. In addition to the different statistics averages of economically active persons in different breakdowns and for differing reporting periods are for instance required as reference values for macro-economic parameters, in order to compute the development of the national product per economically active person. Every computation of averages implies the availability of data for several key days - also from different sources - over the length of the period under consideration. The main emphasis of current estimations is at present on computations of annual, semi-annual and quarterly averages of the active population and of economically active persons in various breakdowns. The original material from which to proceed with the computations are the employment data collected in the large-scale censuses (population and occupation census, census of non-agricultural local units, census of agriculture, and others). For purposes of updating and interpolation of these data, all suitable short-term employment statistics are drawn upon. In addition to the MPS, these are predominately the results of the monthly establishment statistics.

44. Compared with the mentioned statistics the Labour Force Survey is the only method that can yield the type of information required on the labour force, employment, unemployment, underemployment, education, income and other related variables. It is less expensive than a population census though relatively more expensive in terms of population covered. It requires less field staff and can provide more and better information. The results can be used to up-date census data and to provide intercensal estimates. It permits the use of probing questions on a number of complex matters and the results can be made available more quickly than in the case of a population census. One major drawback is that the use of sampling makes it difficult to disaggregate figures too much and data on the micro-level are subjected to wide margines of sampling errors. The Labour Force Survey provide the only practicable means of collecting data from the large sector of own account workers which is important in predominantly agriculture countries.

45. Establishment surveys provide basic data on employment from payroll records. It provides information on amount of labour used in the industrialized sector of the economy. It has a major advantage: it is a method that can provide cheaply recent data on employment changes over time. It provides an excellent short-term economic indicator. Though ideally a benchmark is required (e.g., an industrial census), this is not a major drawback as the emphasis is on trends rather than levels. The use of sampling, e.g., the stratified cut-off sample method significantly reduces the cost of the operation while the rate of response and the quality of the replies increase. The major drawback is that it is limited to employment in the modern sector and thus leaves out the majority of the working population (in developing countries).

46. Other sources of information are the by-products of the administration of government departments. Employment service registers can provide some information on unemployment registration, social security records may be a useful source of information on employment and unemployment etc. They are all limited in scope but they can provide useful supplementary information on some aspects of the country's labour problems and should be studied in conjunction with other sources of information.

STATUS OF INCOME AND EXPENDITURE SURVEYS IN THE CONTEXT OF NATIONAL STATISTICS AND THE DEVELOPMENT PROGRAMME

(a) Evaluation of data

47. Income and consumption sample surveys cover all income and expenditure of private households. They thus supply important data for the assessment of the income situation and consumption, patterns of the population and its various constituent groups. Private households demand is an important factor in the economy and reliable information about it is indispensable not only for successful government trade cycle and structural policies but also for firms' production plans and marketing strategies. Income data are also important for social, taxation and family policies. Over and above this, the income and consumption sample survey supplies important information on households' living standards, e.g., on housing conditions, the supply of consumer durables and on assets and liabilities. These data are required not only to facilitate the governmental and parliamentary decision-making process: both sides of industry, consumer organizations, scientific institutions and business enterprises are dependent on reliable and detailed quantitative data for purposes of analysis, forecasting and planning. Estimates of the likely effects of income changes, tax increases or tax cuts, changes in consumer prices and social security contributions, etc., and of the influence of household consumption patterns on the economy cannot be made without information on household income, expenditure and saving patterns, recourse to credit facilities, tax payments and insurance contributions.

48. The income and consumption sample surveys may be built up an official statistical instrument that is unique in providing information on the relationships between income, consumption and savings formation on the one hand and important socio-economic household characteristics, such as social position and age of the head of household, size of household and type of household on the other. By aligning the statistics as far as possible with the concepts and classification systems of the National Accounts and by extrapolating from the MPS (Chart 3) the value of the results as general economic indicators has been considerably increased.

49. In view of the large number of potential consumers it is impossible to say to what extent and by whom the individual results are used for decision-making and for legislation, planning and analysis. This is particularly true in national administration: the data from sample surveys of income and expenditure are evaluated not only by government departments themselves, but also by many experts and institutes of sciences which draft expert opinions for the government. What follows can therefore only give examples of how the data are used.

(1) Information in income

The data produced by the income and consumption sample surveys respecting household and individual incomes are the main base data for most of the estimates of income distribution according to social groups or size classes. The same is true for the Factor analysis investigations and for investigations into possible ways of estimating progress in lifetime income on the basis of cross-sectional analyses also draw to some considerable extent on the income and consumption sample surveys. The sample surveys of income and consumption are drawn upon to an even greater extent when it is necessary to describe and analyse the economic situation of certain social groups: the "poor", pensioners, the recipients of other state transfer payments, etc.

(2) Information on private expenditure

The results of the survey of private expenditure are the main factor in the calculation of the shopping basket for the price index of all private households. They are also used to check and supplement the results of the calculation of private expenditure by use in the context of the National Accounts. Of the many other purposes, for which these data are used, an important one is their evaluation for the food, drink and tobacco market, including aspects of nutritional physiology, which appears in, among other things, the report on nutrition by the Society for Nutrition and in many other publications. General functions of consumption can also be derived from these data. Finally, the data on private expenditure are used by many ministries for ad hoc investigations such as the compilation of statistics on energy consumption during the oil crisis.

(3) Information on the growth of savings

The information on the amount and nature of savings as a function of household characteristics, in particular the age and social status of the head of households, provided by the sample surveys of incomes and consumption has contributed appreciably to the preparation, development and monitoring of national measures to promote savings, particularly measures to boost workers' savings.

(4) Information on wealth

The sample surveys of income and consumption are often the only ones which allow the wealth of private households to be combined with household characteristics of the most varied types. Although the institutional population, foreigners and high income households are not covered, many calculations of personal wealth distribution are based on the results of the sample surveys of income and consumption, for the reasons given.

(5) Consumer durables in households

The results of the sample surveys of income and consumption with regards to selected durables in households are for many large companies, in particular the motor car and electric equipment industries, a major source of information for market research and the development of market strategies, as the size of the sample survey - unlike the usually much smaller surveys, conducted by other institutes - makes multiple combination of household possible.

(b) Use of administrative records for collecting data on the level and distribution of income - in comparison to household budget surveys

50. A second data source for collecting data on the level and distribution of income consists of the statistical information contained in a number of administrative records, particularly tax returns, sometimes supplemented by other records such as those kept by social insurance bodies (Chart 2). These documents can be processed in two ways: complete processing of all tax returns or selection and use of a representative sample of all returns (surveys on tax records).

51. Complete processing of tax returns is of practically no interest for the development of social indicators. The data obtained do not concern disposable income (or even pre-tax pre-transfer income) but relate to taxable income defined by strictly fiscal procedures, adjustment of which is pointless in view of the impossibility of making imputations or direct corrections on all returns. Moreover, this is a very cumbersome procedure, which is merely a derivative of the tax statistics. Nevertheless in some countries it is practically the only source available and is moreover used in attempted international comparisons, which is clear evidence of their present limitations.

52. The tax record survey is the main data source for a number of countries. Other countries also make extensive use of this type of source, in addition to household surveys.

53. A comparison of incomes declared in a household budget survey with incomes declared to tax authorities in France showed the following conclusions:

(1) The tax authorities data for the agricultural population are virtually meaningless. The determination of agricultural incomes is in any event very difficult in the absence of proper agricultural enterprise accounts. While the income level as ascertained by the household budget survey is on average closer to the level of consumption than the average taxable income, it is clear that the interviewers had great difficulty in evaluating it: there is therefore very little correlation between farmers' incomes and their expenditure.

(2) To a lesser degree, the same difficulty arises in the case of the self-employed, but in their case, the fiscal pressure and the standard of living are, on average, much higher.

(3) As regards the wage-earners, in the case of the less well-paid categories the incomes declared for tax purposes are lower than the incomes declared in the household budget survey; the difference narrows on moving up from the manual worker or office employee group to the executive-supervisor category, and for senior management the converse is found.

54. The overall results of the two surveys were fairly close, although the household budget survey figures showed less dispersion than those of the tax authorities. If only the matched (i.e., identical) households are taken into consideration, however, the result is quite different: incomes as found in the household budget survey are distinctly higher than those in the tax authorities' survey. This difference is much less marked if agricultural households are excluded, but nevertheless still subsists.

STATUS OF HEALTH SURVEYS IN THE CONTEXT OF NATIONAL STATISTICS

55. In some countries, many of the statistics needed to measure progress in reaching health objectives of policy programmes may be obtained from medical records of hospitals, physicians, clinics, and other health care centers, and from mortality and morbidity reports required by government regulations. Clinical tests and medical examinations of a sample of the population may be another source of the medical data. Where such sources are not available or feasible, data can appropriately be collected in household surveys. Furthermore, there are some facts which can be learned only from household members, such as those concerning the circumstances and outcome of an illness or injury and the action taken by the individual. In addition this source provides a very valuable possibility for linking data on health with other social characteristics.

56. Error of response is a major limitation to household interviews. This is particularly true in the queries on morbidity. For diagnostic information, the householder can at best pass on to the interviewer only the information the physician has given to the family if indeed there has been attendance by a physician. For unattended illnesses and injuries, the respondent can provide only a description of the symptoms. Some of the detail, such as the duration of illness, cause of injury, and days lost from usual activity, give some indication of the seriousness of the illness or injury. Considerable study of the validity of responses to survey questions on illness would need to accompany the development in countries where the household survey technique is relatively new.

57. Morbidity statistics in general is gaining more and more weight. Prevalence and incidence are being measures through "case" and "person" statistics. The case statistics include cases of disease, accident, and disability, so that one person could be counted several times. The person statistics, however, determine deseases or injuries, or disabilities affecting one person.

58. The case morbidity statistics serve only a limited purpose. Either they include only certain types of diseases (e.g., statistics of notifiable diseases), or only particular groups within the population (e.g., statistics of types of diseases by the statutory health insurance). The various case morbidity statistics carried out in the Federal Republic of Germany are separately shown in Chart 5. These are current statistics published by the administration and/or official statistics from ministries or other insurance bodies. In addition, attention has to be paid to the statistics of recognizable congenital and stillbirth malformations, collected on the basis of reports, especially by medical doctors and midwives assisting at delivery.

59. The person morbidity statistics, on the contrary, provide important information of the state of health of the population, particularly as details about demographic and social-economic background on the persons suffering from disease or injuries (caused by an accident) can be obtained. Of the three stages Surveys of the population, Surveys at G.P.s' surgeries, Surveys in hospitals, only the first method is being used nationwide for the whole population in multi-purpose household surveys (MPS) or special household surveys. Surveys at G.P.s' surgeries, or medical examinations, are very time consuming and involve a lot of work. So experience in this field is limited and only available through statistics on protection of the juvenile workers (of some regions) and statistics of the first medical examination of military recruits (minor disabilities).

60. Surveys in hospitals include only selected cases and/or injuries from accidents. The resulting reduction in the number of investigations is, however, counterbalanced by the simplicity of the method and the relative reliability of diagnosis.

61. Household Surveys have the obvious advantage of showing the state of health of the population in the widest sense. In contrast to the other methods, morbidity can also be determined when no GP is being consulted or hospital assistance sought.

62. In many countries, population surveys (enquiries by lay people) were made in addition to population random samples. This combination allows one also to consider the demographic and socio-economic background of the person suffering from disease. The problems of population random samples result on the one hand from putting questions to lay people, and on the other hand from carrying out the survey by lay people.

THE ROLE OF HOUSEHOLD SURVEYS IN PROVIDING INFORMATION FOR POLICY PLANNING

(a) Users of survey data in developing countries

63. The role of household surveys in providing information for policy planning, bend mark information for developing programmes, current information for monitoring programmes and post facto information is emphasized in Chapter 4 (uses of survey data) of the NHSCP-Prospectus. We would like to refer to this remark. As it is mentioned there, a lot of socio-economic data of nearly all UN-recommended topics and items derived from household surveys have been found most useful and effective in response to this demand.

(b) Supplementary surveys to the continuing Household Survey (Microcensus)

64. The Microcensus took on the essential characteristics of a "multi-purpose sample survey", as a result of the wide variety of topics which were surveyed and analysed under supplementary programmes (authorized by Orders).

65. As Chart 6 shows, the supplementary programme covers a wide range of very varied topics. It extends from questions of health and social welfare, via leisure and training questions, characteristics of the physical and urban environment (including working conditions) to questions on the social and spatial mobility of specific population groups. The supplementary sets of interviews set out to cover either all the persons already included in the basic programme or a portion of them. This portion may be either a specific age group or a specific portion of the working population (e.g., employees or working mothers) or some other population group, which can be clearly defined by characteristics contained in the basic programme. The supplementary set of interviews may also set out to cover a specific group of families (e.g., families with children under 15 years of age) or households (e.g., households the head of which is a foreigner or a civil servant) or a portion of the inmates of homes and similar institutions (e.g., the inmates of retirement homes and nursing homes, a particularly informative group for the purposes of the care of the old). Every supplementary survey of this type must be examined in advance to determine whether the sample size may be set below the maximum sample used in the basic survey (1 per cent), particularly for reasons of cost, i.e., whether a lower sample size (e.g., 0.5 per cent, 0.25 per cent or 0.1 per cent), will still give significant results at Federal or Land level. The criteria are the size of the group of persons to be surveyed and the required sub-division of the programme by topic and region.

66. Basically, the motive behind every supplementary survey is a request from a Federal Ministry for statistical information on a political decision, either one which has already taken place or one which is still in preparation. As part of the justification for the new Microcensus Law, for example, the legislature regarded the results of the "diseases and accidents group" as essential both for considerations of health policy and as part of the overall system of morbidity statistics, since they provide knowledge on the morbidity of the population and on changes in the disease pattern which cannot be obtained at the present time by any other method. As a result of the positive experience obtained with this group of topics, the supplementary surveys of this type are to be widened by the addition of groups of questions relevant to health policy. These include in particular the detection of the major risk factors and indicators in the population, such as food and smoking habits, negative environmental factors, etc., as well as information on the extent to which the health services are called upon, such as the frequency and type of contracts with doctors and the extent to which the population makes use of the preventive and early warning measures available.

67. All the other supplementary programmes, either already carried out or in preparation, are of similar significance for the government's planning activities. This applies equally well to the supplementary surveys which also obtain opinions and intensions of the subjects. To date it has been possible to put questions of this type only in three surveys carried out during the period 1971/78. In the 1978 sample survey on housing, linked with the microcensus, questions were put for the first time on the relationship of the dwellings to their environment, on noise or smell nuisances, etc. These are questions which taken in conjunction with the data on family strcutures are also significant for the procurement of social indicators; for example, questions on the subjective assessment of opportunities for children to play, shopping facilities, the distance from the place of work or the accessibility or otherwise of public transport. In some cases these could be "checked" by objective questions, relating to the selected area concerned and submitted for answer to the administration of the relevant local area or town.

68. A wide-ranging supplementary survey on the "changes in occupational and social levels in the population" was intended to permit the question of the subjects' own assessment of their occupational position by comparison with that of their fathers to give a subjectively slanted indication of the degree of inter-generation mobility possible. The objective of the survey on the "parents' educational intentions for their children" was to investigate the type and influence of the family structure which determine the scholastic and vocational education of children and young persons. Only if such knowledge is obtained, in the view of the Federal Government's report on families, will it be possible to take effective measures under family and educational policies.

THE ROLE OF HOUSEHOLD SURVEYS AS A BASIS FOR ANALYTICAL, ATTITUDINAL, BEHAVIOURAL AND DIAGNOSTIC RESEARCH

69. The preceding description of the microcensus as a multi-purpose sample survey and thus also as an instrument for obtaining information on social indicators requires some further general comments so as to throw light on the preconditions and possibilities of such a survey. Of note here are on the one hand the linking of the microcensus to the statistical study of population, and on the other the current trends in official statistical studies. The linking of the microcensus with the large-scale population censuses is one of the major factors in the statistical study of population as a whole (Chart 1 and 8). Starting from the latest population census, therefore, the microcensus may be regarded methodologically speaking as a network of interlocking interviewing stages, all related to one another and some of them of increasing intensity. A major theoretical pre-condition for such a network of statistical surveys is the fact that the current sampling plan of the microcensus (based on the principle of area sample surveys) is equally representative of persons, families, households, dwellings and buildings, since the recording areas cover only complete buildings. This type of network may be imagined in the form of a pyramid (Chart 7). Using the example of a supplementary survey covering the care of children of working mothers, this chart shows how such a survey of a specific group of women who are employed and have children under 14 years old may be linked with the results of corresponding comparative groups for which the principal data are available from the microcensus and where applicable from the population census, and also with more detailed information from follow-up (not necessarily official) surveys of different kinds (incl. special opinion surveys).

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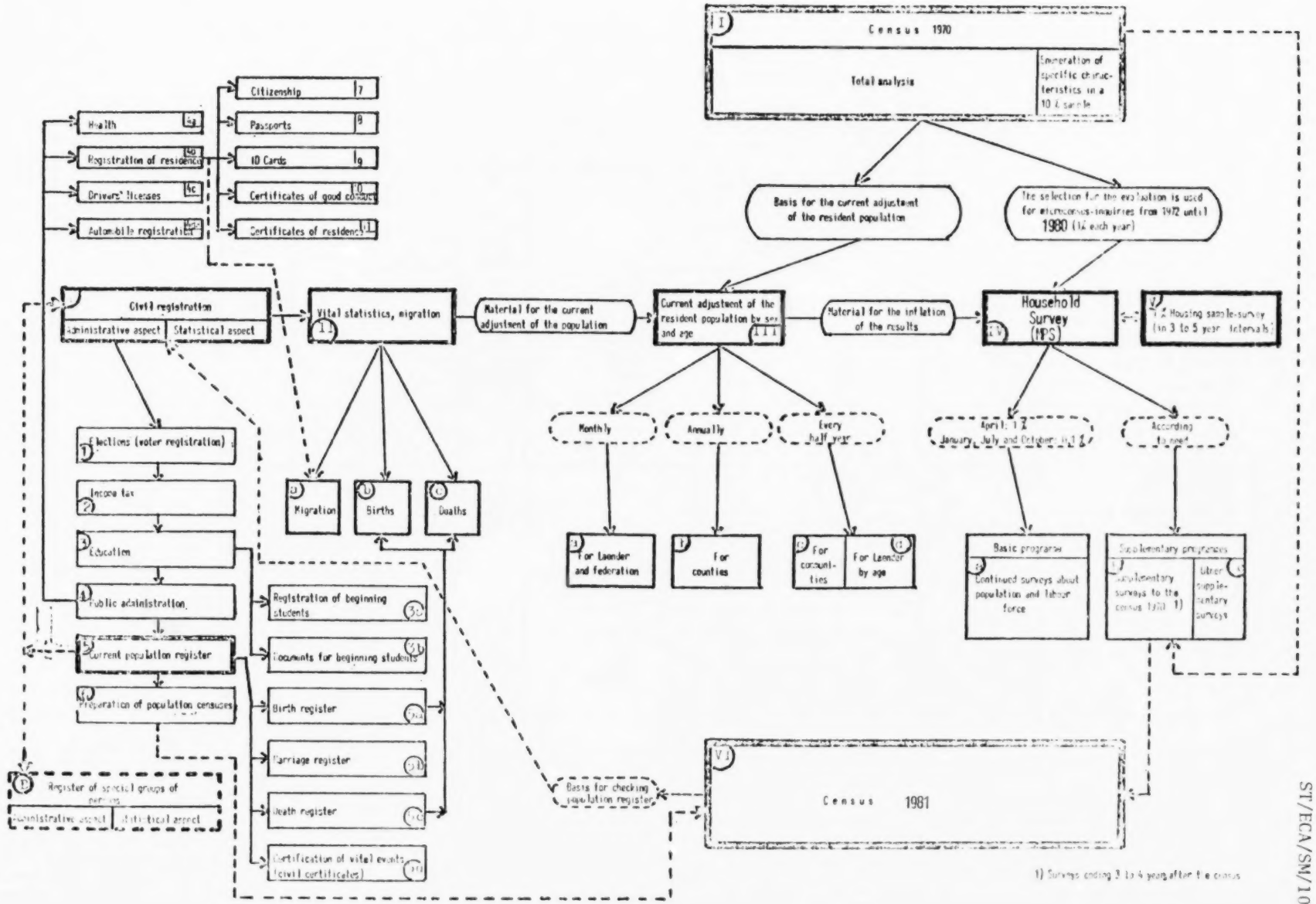
Chart 1: System of population statistics, intercensal household surveys, civil registration and tabulation registers


I
Census 1970
Total analysis
Enumeration of specific characteristics in a 10 % sample
Basis for the current adjustment of the resident population
The selection for the evaluation is used for microcensus-inquiries from 1972 until 1980 (1% each year)
Citizenship 7
Passports 8
ID Cards 9
Certificates of good conduct 10
Certificates of residence 11
Health 4a
Registration of residence 4b
Drivers' licenses 4c
Automobile registration 4d
Civil registration
Administrative aspect
Statistical aspect
Vital statistics, migration 11
Material for the current adjustment of the population
Current adjustment of the resident population by sex and age 111
Material for the inflation of the results
Household Survey (HPS) 12
1 % Housing sample-survey (in 3 to 5 year intervals) 13
Monthly
Annually
Every half year
April, 1 %
January, July and October: 0,1 %
According to need
Elections (voter registration) 1
Income tax 2
Education 3
Public administration 4
Current population register 5
Preparation of population censuses 6
Register of special groups of persons
Administrative aspect
Statistical aspect
Migration D
Births G
Deaths C
Registration of beginning students 3a
Documents for beginning students 3b
Birth register 21a
Marriage register 21b
Death register 21c
Certification of vital events (civil certificates) 21d
For Laender and federation
For counties
For communities
For Laender by age
Basic programme
Continued surveys about population and labor force
Supplementary programmes
Supplementary surveys to the census 1970 1)
Other supplementary surveys
Basis for checking population register
VI
Census 1981
1) Surveys ending 3 to 4 years after the census

ST/ECA/SM/10

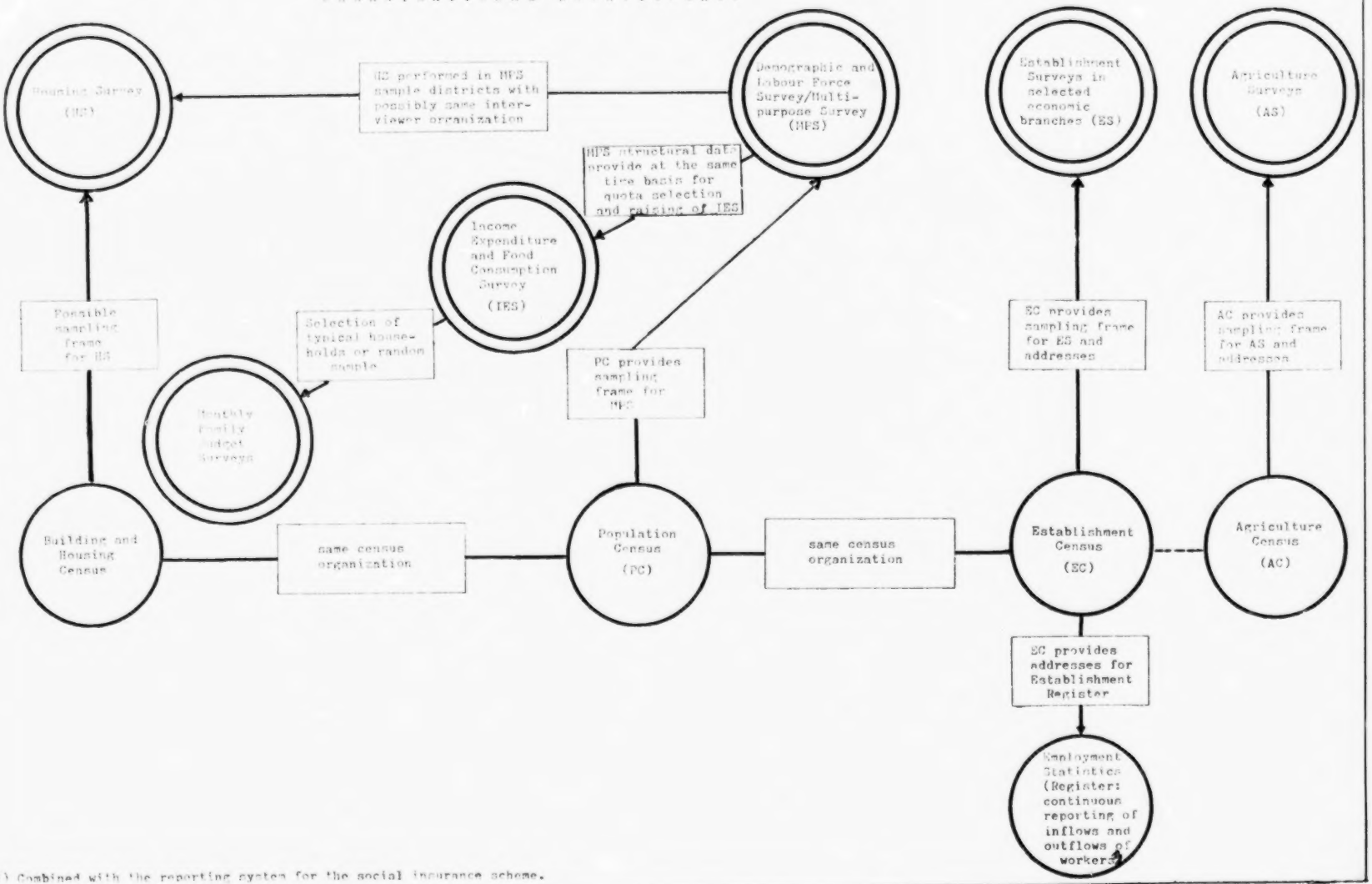
Chart 2: Possible courses of reporting for securing person or household-related data

No.	Topic	Possible courses of reporting										
		Household Surveys (Type of inquiry)			Non-Household Surveys (Establishment and other Surveys)	Censuses		Administrative records				
									Special records (e.g.)			
		Continuing (multi-subject)	Supplemental (multi-subject)	Special (uni-subject)		Population and Housing	Establishment[2] (and others)	(Public) general register[3]	Labour Office	Hospital	School University	Tax returns
1	Demographic characteristics [1]	x	x		(x)	x		x	(x)			
2	Labour Force	x	x		x	x	x	x	x			
3	Income and Expenditure		x	x	x	(x)	(x)	x				x
4	Food Consumption and Nutrition		x	x	x (Producer, tradesman)							
5	Housing Conditions and Facilities	x	x	x		x		x				
6	Health		x	x				x		x		
7	Educational characteristics		x		(x)	x			(x)		x	
8	Household economic activities (Household enterprises)	(x)	x		x	x	(x)					

1) Incl. fertility, mortality, migration.- 2) Agriculture and other economic censuses.- 3) E.g. Population Register (No. 1), old age insurance records (2,3), estate and building register (5), health service and insurance records (6).

Chart 1: ROLE OF HOUSEHOLD (AND ESTABLISHMENT) SURVEYS IN NATIONAL STATISTICAL SYSTEMS

ORGANISATIONAL RELATIONSHIP


Housing Survey (HS)
HS performed in MFS sample districts with possibly same interviewer organization
Demographic and Labour Force Survey/Multi-purpose Survey (MFS)
Establishment Surveys in selected economic branches (ES)
Agriculture Surveys (AS)
MFS structural data provide at the same time basis for quota selection and raising of IES
Income Expenditure and Food Consumption Survey (IES)
Possible sampling frame for HS
Selection of typical households or random sample
Monthly Family Budget Surveys
PC provides sampling frame for MFS
EC provides sampling frame for ES and addresses
AC provides sampling frame for AS and addresses
Building and Housing Census
same census organization
Population Census (PC)
same census organization
Establishment Census (EC)
Agriculture Census (AC)
EC provides addresses for Establishment Register
Employment Statistics (Register: continuous reporting of inflows and outflows of workers)

1) Combined with the reporting system for the social insurance scheme.

Chart 4: Selected characteristics and groupings of major statistics covering economically active persons and/or persons engaged

Characteristics and groupings	Population census	Labour Force Survey (MPS)	Employment statistics*)	Census of non-agricultural local units	Census of agriculture	Census of industry	Census of building industry	Census of handicrafts	Census of distribution	Statistics of labour in agriculture	Industry reports	Building reports	Reports on handicrafts	Statistics of public service personnel
Characteristics and groupings relating to demographic and educational statistics														
Sex	x	x	x	x	x 1)2)	x	x	x	-	x	-	-	-	x(every 3 years)
Age (year of birth)	x	x	x	-	x 1)2)	-	-	-	-	x	-	-	-	x(every 6 years)
Nationality	x	x	x	x		-	-	-	-	-	-	-	-	-
Marital status	x	x	x	-	x 1)2)	-	-	-	-	-	-	-	-	x(every 6 years)
Family/household structure	x	x	-	-	x	-	-	-	-	-	-	-	-	-
Education	x	x(planned)	x	-	x 3)	-	-	-	-	-	-	-	-	-
Characteristics relating to employment and economic statistics														
Branch of industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x central government annually, communities every 3 years (functions)
Size of establishment	x (of self-empl.)	-	-	x	x	x	x	x	x	x	x	x	-	-
Occupation	x	x	x	-	-	-	-	-	-	-	-	-	-	x
Social status - Socio-economic structure (status in the local unit, employment status, service and employment relationship)	x	x	x	x	x 1)	x	x	x	x	x	x	x	-	x
Manhours/hours worked and/or full-time or part-time employment	x	x	x	-	x 1)2)	-	-	-	x	x	x	x	-	x
Secondary activities	x	x	x	-	x 1)	-	-	-	-	x	-	-	-	-
Principal means of subsistence of economically active persons	x	x	-	-	x 4)	-	-	-	-	x 4)	-	-	-	-
Characteristics and groupings of regional statistics														
Place of work	x (on commuting)	x (on commuting)	x	x	x	x	x	x	x	x	x	x	x	x
Place of residence	x	x	-	-	-	-	-	-	-	-	-	-	-	-
Commuter status	x	x	feasible under certain conditions	-	-	-	-	-	-	-	-	-	-	-
Means of transportation used	x	x(planned)	-	-	-	-	-	-	-	-	-	-	-	-
Time required	x	x(planned)	-	-	-	-	-	-	-	-	-	-	-	-
Federation	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Land	x	x	x	x	x	x	x	x	x	x	x	x	-	x
Administrative district	x	x(sel. characteristics only)	x	x	x	x	x	x	x	-	x	x	-	-
Kreis	x	-	x	x	x	x	x	x	x	-	x	x	-	x(every 3 years)
Community	x	-	x	x	x	-	x	-	-	-	-	-	-	-
Non-administrative territorial units	x	x	-	x	x	-	-	-	-	-	-	-	-	-

1) Proprietor and members of his family, relatives and in-laws living on the holding.- 2) Permanent hired labour of agricultural or forestry holding.- 3) Operator and person responsible for the operation of the household of the holding.- 4) Proprietor and/or spouse.

*) Basis: social security records.

Chart 5: Survey of morbidity statistics in the Federal Republic of Germany

Item	Cases											Persons		
	Notifiable deases			Total stat. on Rehabilitation	Rehab. measures (im prep.)	Disabled persons (in prep.)	Road Accidents	Statutory Acc. Ins.	Statutory Old Age Ins.	Types of diseases acc. to Statutory Health Ins.	Private Health Ins.	Phys. disabled persons	Persons sick or injured by accident	Diseases and Accidents
	Tuberculosis	Epidemic diseases	venereal diseases											1970 - 1982
1. Survey bases														
1.1 Legal foundation		Law		Adm. records	Law		Law	Administrative records						Edict
1.2 Periodicity (period under review)	quart., ann.	mthly., quart, ann.	quart., ann.	annually		every 5 yrs.	mthly., ann.	semi., ann., ann.	annually					April (stagged 4 week period)
1.3 Respondents	tb-agencies of Health Offices	Healt Offices		Selected bodies for Rehabilitation	Bodies for Rehabilitation	Pension Offices	Police Offices	Insurances		Stat. health ins.	Private health ins.			Households
1.4 Sampling fraction	not applicable													1 %
2. Survey characteristics														
2.1 Medical statistics 2.1.1 Enumeration item	Prevalence	Incidence		Cases of rehabilitation		Prevalence	Incidence	Incidence/ at time beneficiaries, industrial diseases	New pensioners	Cases of incapability of work	Benefit (DM)	Prevalence	Prevalence/ Incidence	Prevalence Accident: Incidence
2.1.2 Type and cause of morbidity 2.1.2.1 Type of disease	defined by law			-	-	-	-	-	ICD	Diagnosis code: Bodies of Social Ins.	Hamburg diagnosis code	-	Diagnosis code: Bodies of Social Ins.	Diagnosis code following ICD
2.1.2.2 Type of accidental injury	-	-	-	-	-	-	by degree of severity	-				-		
2.1.2.3 Category of accident								+		+		+	+	+
2.1.2.4 Type of disablement	-	-	-	ICD possibly modified ICD			-	-	-	-	-	+	-	-
2.1.2.5 Cause of disablement	-	-	-	+	+	+	-	-	-	-	-	+	-	+/-
2.1.3 Duration of sickness	-	-	-	Duration of rehabilitation		-	-	-	+	Duration of incapability of work	Duration of stay in hospital	+	+	+
2.1.4 Type of treatment	-	-	-	+	+	-	-	-	+	+	-	-	+	+
2.1.4.1 In-patient	-	-	-	+	+	-	-	-	+	+	-	-	+	+
Out-patient	-	-	-	-	-	-	-	-	+	+	-	+	+	+
2.1.5 Other characteristics	-	-	former illnesses	Result of rehabilitation, measures, reduced capability of work		-	-	Reduced capability of work	-	-	-	Reduced capability of work		Confinement to bed
2.2 Population statistics														
2.2.1 Age	+	+	+	+	+	+	+	+	+	+	- (childr.)	+	+	+
2.2.2 Sex	+	+	+	+	+	+	+	+	+	-	+	+	+	+
2.2.3 Marital status	-	-	-	-	-	poss.	-	-	+	-	-	+	+	+/-
2.2.4 Family Size	-	-	-	-	-	-	-	-	+	-	-	+	+	+/-
2.2.5 Nationality	+	-	-	-	+	+	-	+	-	-	-	-	-	-
2.3 Employment statistics 2.3.1 Economic activity	-	-	-	+	+	+	-	+	+ (disability to work)	-	-	+	+	+/- disability to work
2.3.2 Employment statistics	-	-	-	+	+	+	-	-	-	-	-	+	+	+/-

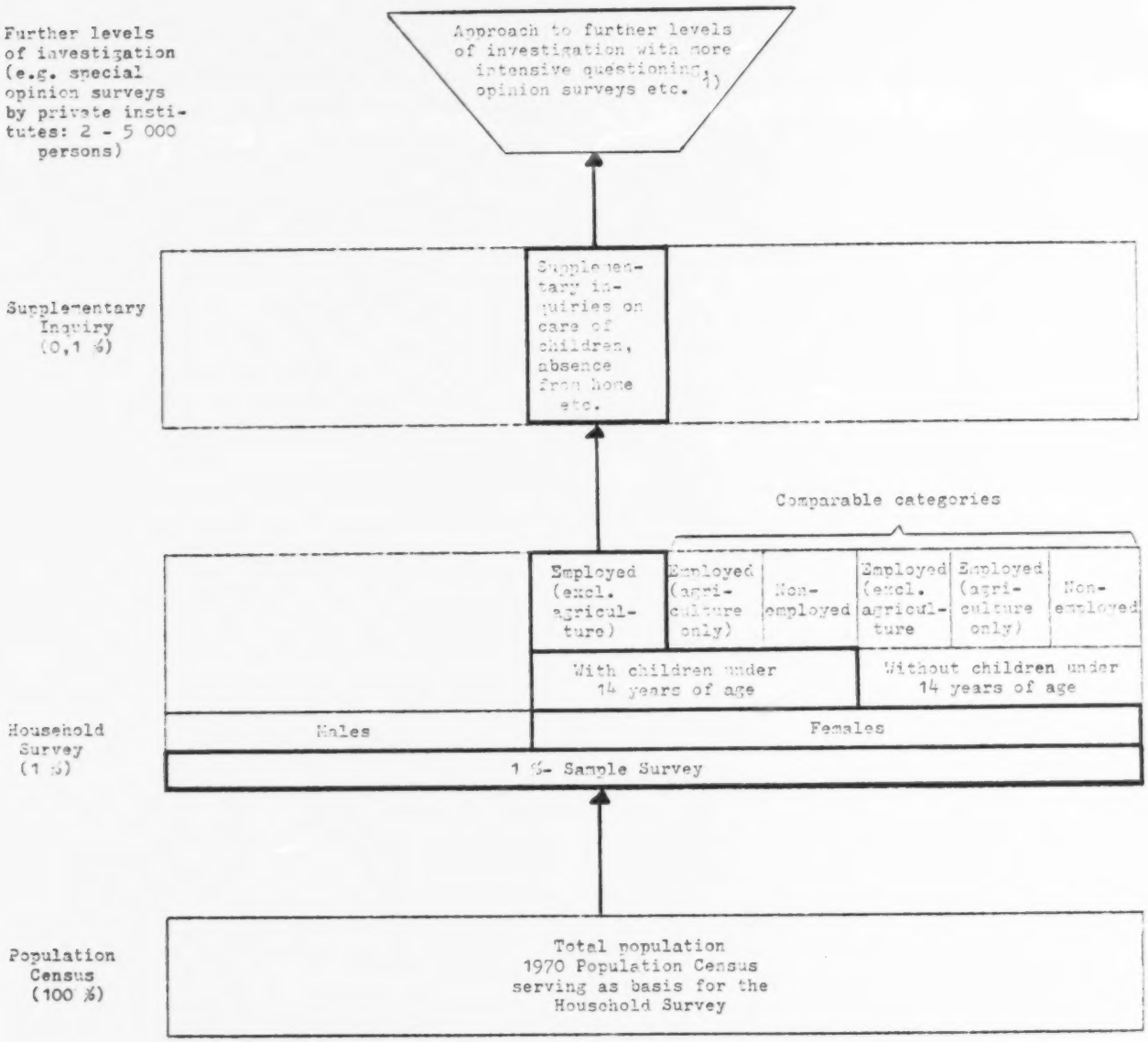
Abbreviations: + = data available
- = no data available

Chart 6: Supplementary Surveys to the continuing Household Survey (Microcensus) and Special Household Surveys

Series No.[1]	Topic - Title of the sample survey	Sampling fraction (per cent)
1	Basic Program: Demographic characteristics and basic items of the other UN-topics	1.0
2 (a)	Employment	
	- Weekend commuters	1.0
	- Characteristics and functions of activity of economically active persons	0.1
	- Extent of leave according to labour-managment contract	0.1
	- Night and Sundaywork	1.0 and 0.1
	- Termination of the working time on weekend	0.1
2 (b)	Social Mobility	
	- Economic activity of woman 40 to 65 years of age	0.5 - 1.0
	- Occupational and social mobility of the population	1.0
	- Occupational mobility of women	0.1
3 (a)	Income and Expenditure Survey (Special Household Survey)	0.25
3 (b)	Saving	
	- Property effective saving	1.0 / 0.1
4	Food Consumption and Nutrition	
	- Cultivation of vegetables and potatoes on plots of under 0.5 hectares	1.0
	- Purchasing facilities and bying behaviour in large cities	0.1
5	Housing Survey (Special Household Survey)	1.0
6	Health	
	- Illness and accidents	0.5 - 1.0
	- First-aid training	0.1
	- Accidents involving children and juvenile aged under 15 years	1.0
	- Physical and mental dissability	0.25
	- Physical and mental dissability of children	1.0
7	Education	
	- Care of children under 15 years of age of working and nonworking mothers	1.0 and 0.1
	- Vocational training	1.0
	- Vocational and continuing training	1.0
	- Educational aims envisaged by parents for their children	0.1
8	Others	
	- Holiday and recreation trips	1.0
	- Holders of driving licences; utilization of the licences	1.0
	- Short trips and day's excursion traffic	0.1

1) See Chart 2.

Chart 7: Integrated System of Household Surveys as an example of multilevel inquiries


Further levels of investigation (e.g. special opinion surveys by private institutes: 2 - 5 000 persons)
Approach to further levels of investigation with more intensive questioning, opinion surveys etc. 1)
Supplementary Inquiry (0,1 %)
Supplementary inquiries on care of children, absence from home etc.
Comparable categories
Employed (excl. agriculture)
Employed (agriculture only)
Non-employed
Employed (excl. agriculture
Employed (agriculture only)
Non-employed
With children under 14 years of age
Without children under 14 years of age
Household Survey (1 %)
Males
Females
1 %- Sample Survey
Population Census (100 %)
Total population 1970 Population Census serving as basis for the Household Survey

1) E.g. required for the calculation of subjective social indicators.

Chart 1: System of statistical observation of population processes in the Federal Republic of Germany